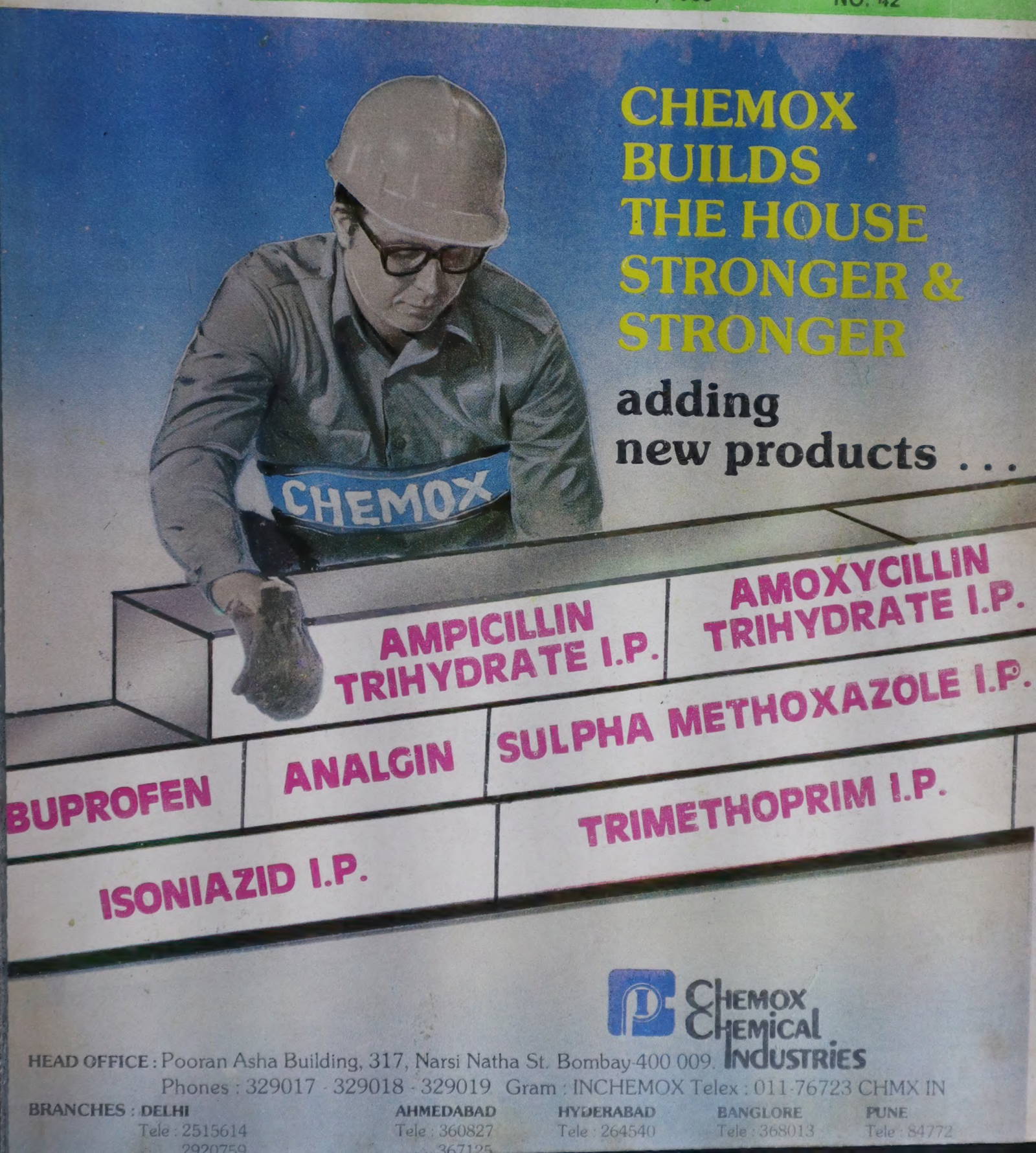
33rd YEAR

R. N. No. 1972 57

CHEMICAL WEEKLY

VOL. XXXIII JUNE 28, 1988 NO. 42



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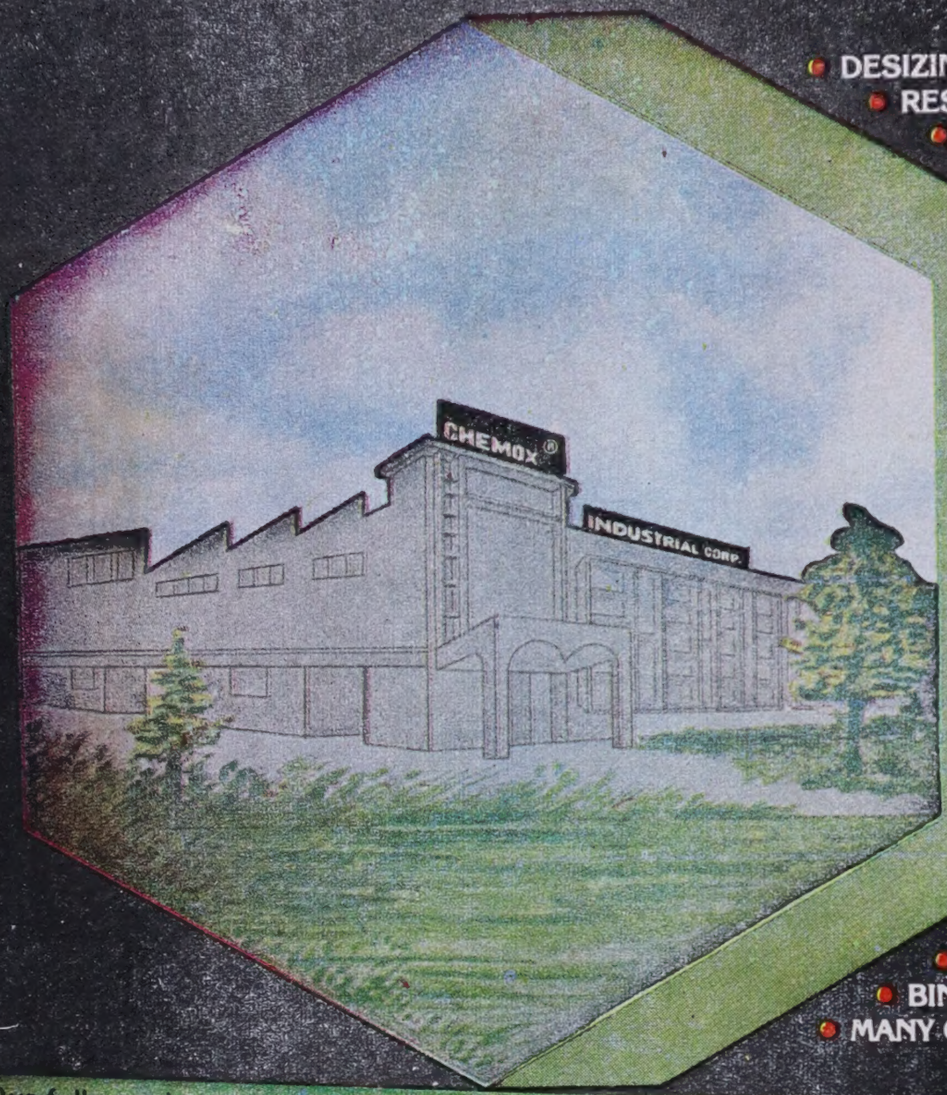

- DESIZING AGENTS
- RESINS UF DMEU DMDHEU HVS ATE AMH
- WETTING AGENTS & DETERGENTS
- NONIONIC SOFTENERS
- ANIONIC SOFTENERS
- CATIONIC SOFTENERS
- REACTIVE SOFTENERS
- WAX EMULSIONS
- EMULSIFYERS
- ANTIRUBBING AGENT
- POLYETHYLENE EMULSION
- ANTISTATIC AGENTS
- STAIN REMOVING AGENTS
- LEVEL DYEING AGENT
- DISPERSING AGENT
- SIZE SOFTENERS
- CHELLATING AGENTS
- DEFOAMERS
- GUMS
- TURKEY RED OIL
- SOLVENTS
- ANTI-MILDEWING AGENTS
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* HYDROXY ETHYL CELLULOSE
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  Anatase-3328 (Whittakar)
* GUM ACACIA IP (SUPERWHITE)
* PETROLEUM ETHER 40°-60°
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* LACTIC ACID U.S.P.
* PARA CHLORO META CRESOL (PCMC)
* SOYA LECITHIN (Brazil)
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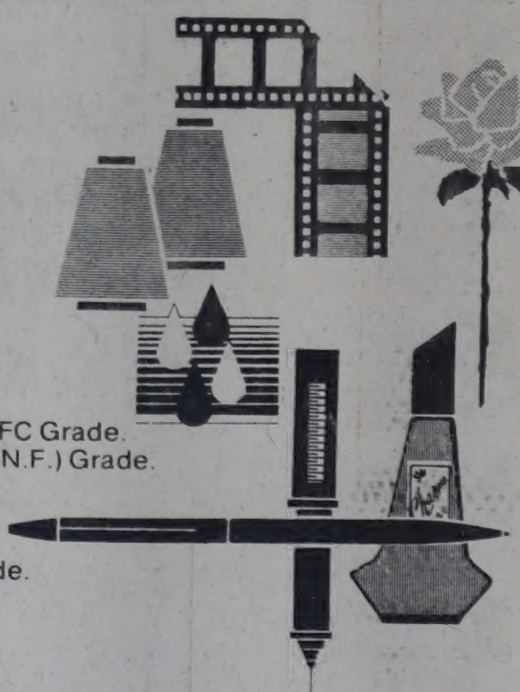

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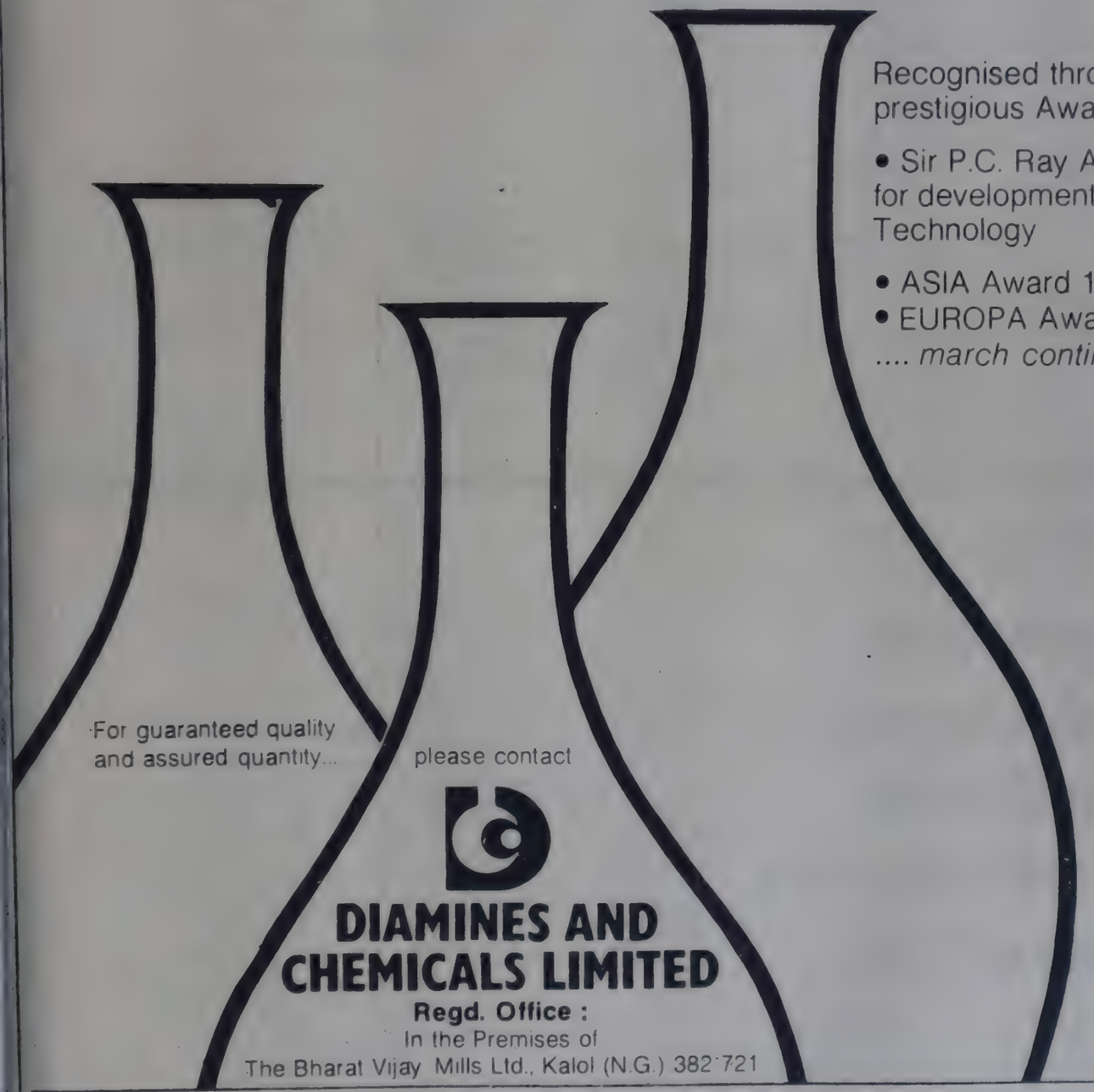

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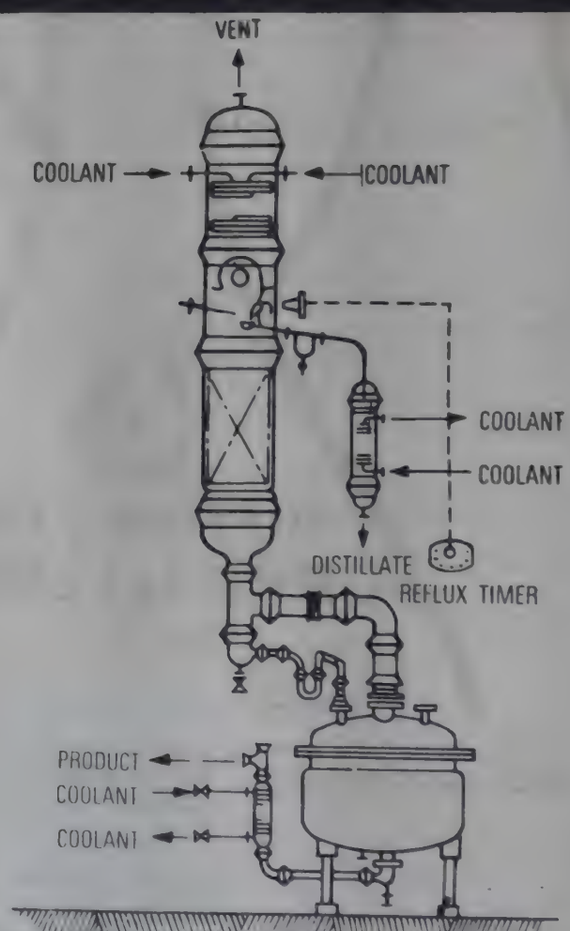

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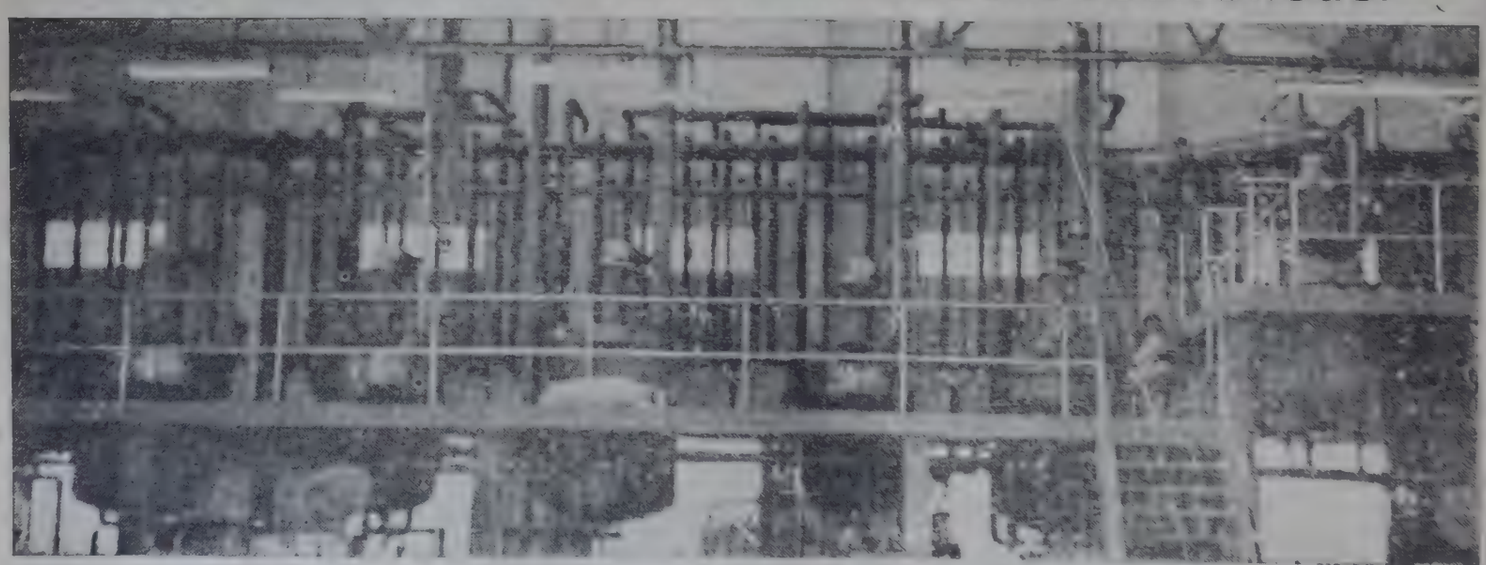

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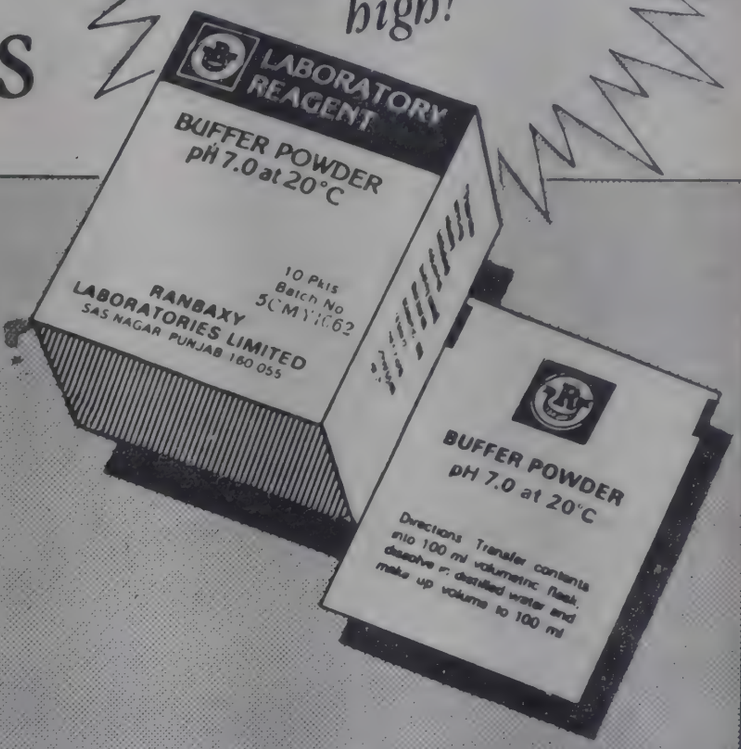

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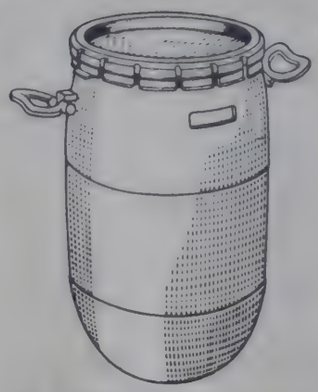
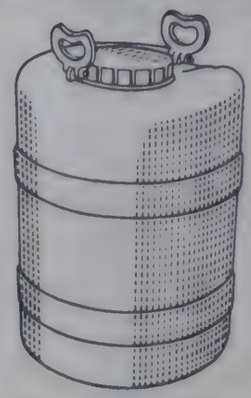


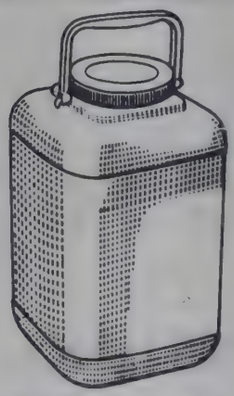
30 Kgs. Round Drum
Full Top Open – 10" Cap



50 Kgs. Round Drum
– 6" Cap

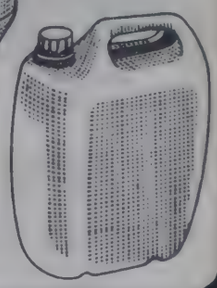
30 Kgs. Round Jar
– 6" Cap

20 Kgs. Round Jar
– 6" Cap



6 Kgs. Square Jar
– 4" Cap

5 Ltrs.
Jerry Can



6 Ltrs.
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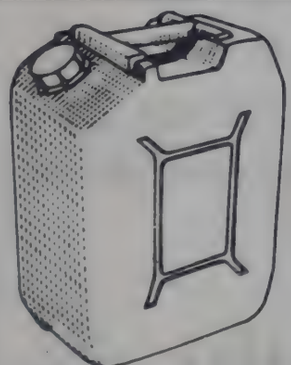

30 Ltrs. Jerry Can
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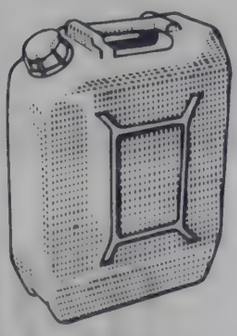
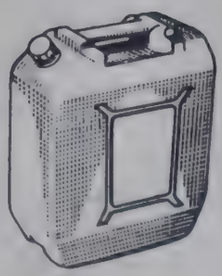


20 Ltrs. Jerry Can
Stackable



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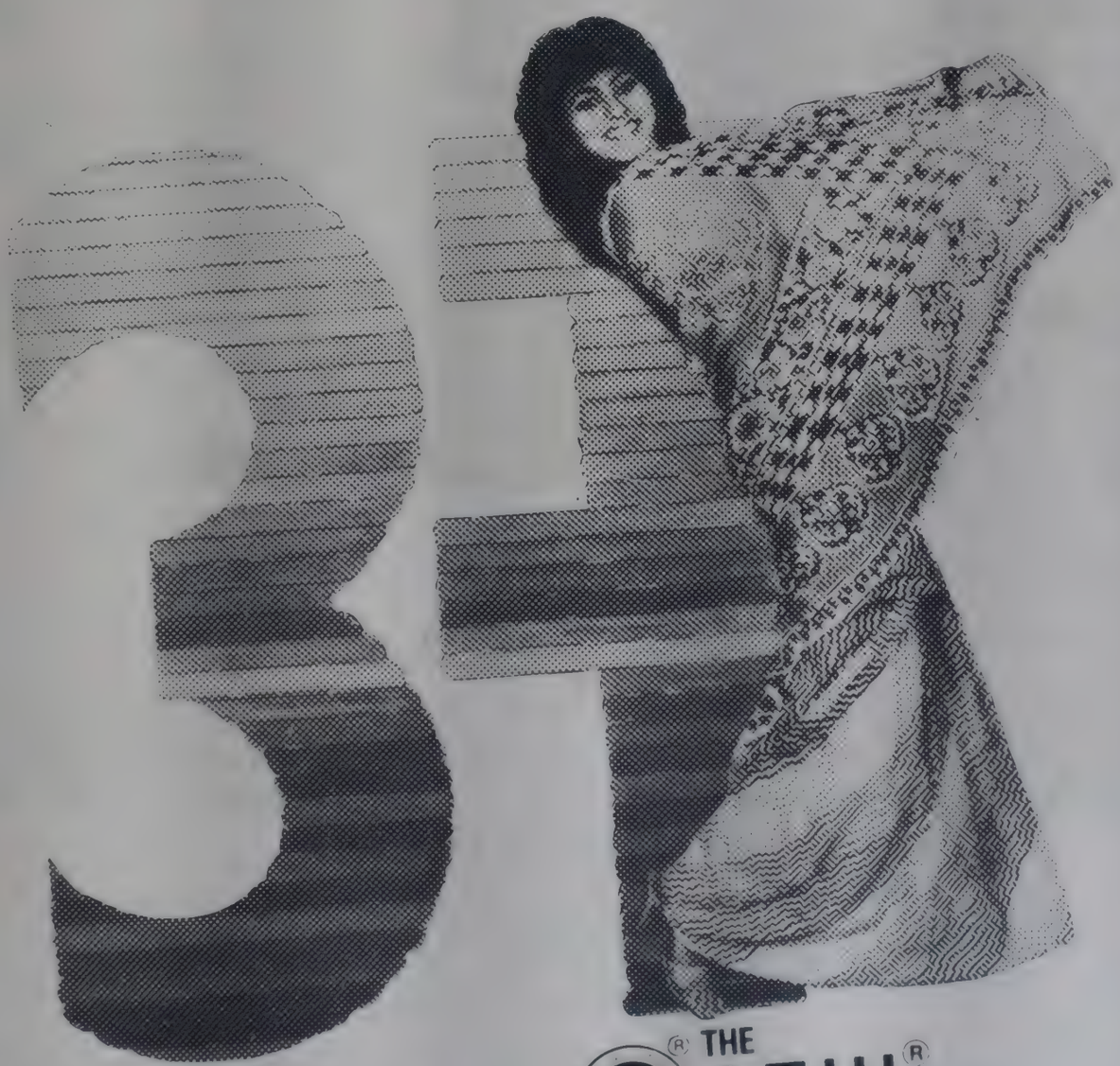

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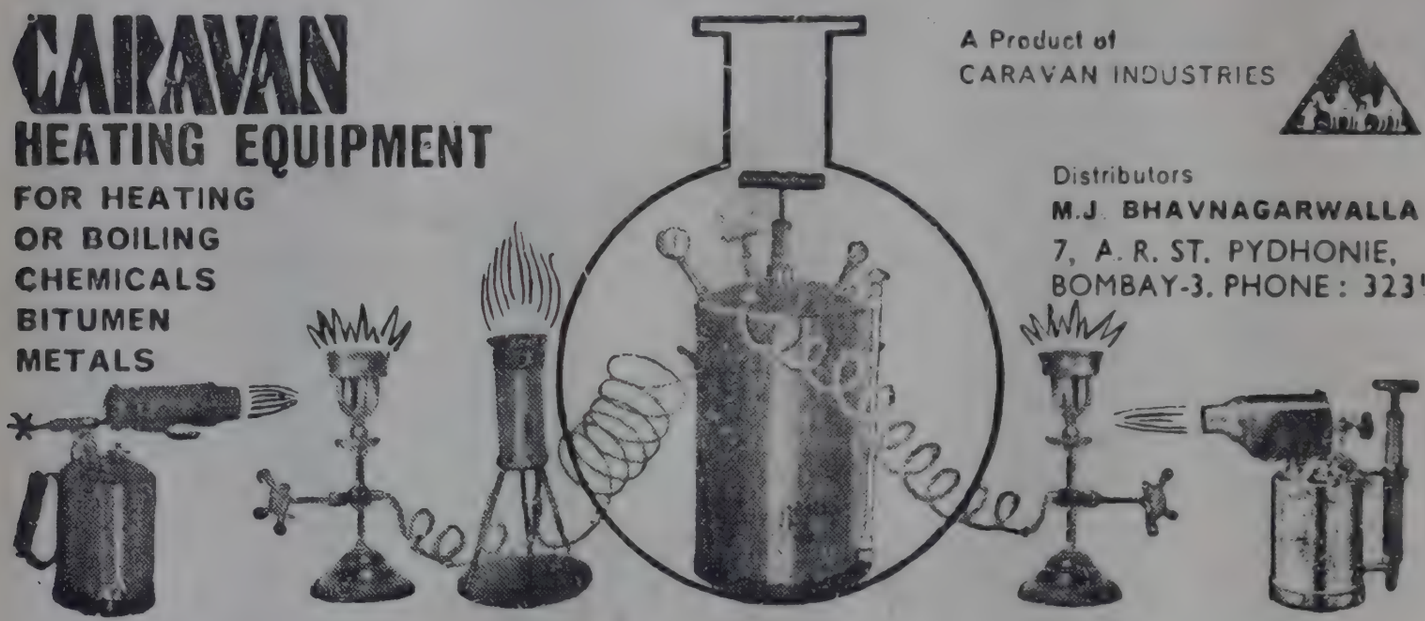

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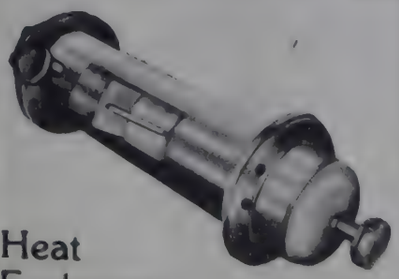
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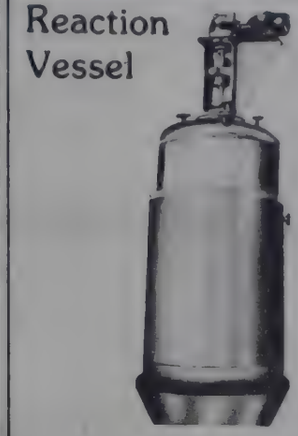
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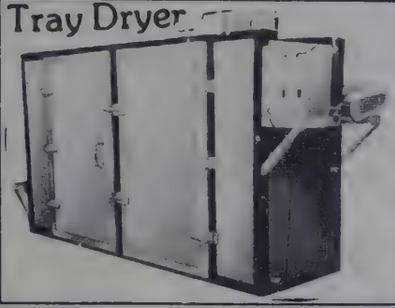
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CHEMICAL WEEKLY

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Lasers — the many Splendoured Beam of Light

What instrument can detect finger prints, weld car parts, husk peanuts, drill holes in baby bottle nipples, transmit phone calls, repair detached retina, stop a speeding atom dead on its track, measure continental drift, shoot down missiles, remove atherosclerotic plaque from clogged arteries, check out food purchases, print a document, cut fabric for a suit of clothes, align a subway tunnel and create a work of art? The device in question is the LASER (an acronym for the Light Amplification by Simulated Emission of Radiation). The above list is only for starters. Today laser has become an indispensable tool in industry, manufacturing, medicine and communications. And its influence continues to grow.

Laser is "harnessed light". It all began with Albert Einstein. In 1917 he predicted that under certain conditions light absorbed by atoms or molecules could stimulate them to emit additional radiation of the same wavelength. No serious effort to use this effect was made in the next thirty years, till Dr. Charles H. Townes, a laser pioneer and Nobel Laureate (working at the University of California) appeared on the scene. The first laser beam built in 1960 used a ruby crystal as the amplifying medium but lasers today use a wide variety of metals including gases like carbon dioxide, solid crystals like a mixture of yttrium, aluminium and garnet — the YAG-laser, liquids of complex organic dyes and semi-conductors.

"In theory" says Dr. Bernard S. Finn, Curator of the Smithsonian institution "you can get nearly anything to lase". In fact, early in the development of the laser, Finn notes, one Wag suggested a "Jello-O Laser". His paper was published appropriately on April 1, 1961 (all Fools day). Actually — both Jello-O and tonic water have been made to lase but as one scientist quipped "They taste terrible". An edible laser may not yet be in the offing but, something nearly approximating to this prophesy has come to be developed in 1987. Excimer Lasers were invented only about twelve years ago; yet the number of applications for these useful tools is growing rapidly. They range from separating isotopes to sterilising wine. One of the Companies at the forefront of research into excimer applications is Lamda Physik of Gottingen, West Germany, (represented in the UK by Coherent (UK) of Cambridge).

One of the most attractive applications so far, if not the most economically viable, is the use of excimer lasers to sterilise wine. The traditional way to get rid of unwanted organisms in wine is to treat it with sulphur dioxide. If this is done inexpertly, as is the case with some cheaper white wines, the drinker can experience the unpleasant whiff of sulphur on the nose — and an even worse headache the morning after. Excimer lasers can sterilise wine without the thermal degradation of the product that would result if a carbon dioxide laser were used.

Of the lasers' myraid and seemingly endless uses, none is more surprising and gratifying to the laser pioneer, Charles Townes than its application to medicine. Laser has come to be known in medical parlance as the "bloodless scalpel". Lasers have literally invaded the operating room. "Throw out the Scalpel and pick up the laser", is the current popular slogan among the medical fraternity. In the near future surgeons will be trained as 'microendoscopists and bioengineers' rather than as "butchers and carpenters". That is the view of John Wickham, head of the Academic Unit of London's Institute of Urology. He predicts the end of the era of heroic surgery in which the eminent fictional (but wholly believable) surgeon Sir Lancelot Sprott advised his trainees to make a "good big incision you can get your head into".

This radical change in surgery is already well advanced, spurred on by the advent of fibre optics and the laser. The fibre enables the surgeon to reach and visualise parts of the body that were only previously accessible by open section, and the laser enables him to carry out the required treatment. According to Mr. Wickham: "True surgical skill now depends increasingly on minimising the trauma of access while still carrying out the definitive operative correction in miniature, often with ancillary and endoscopic instrumentation".

The advantages of a less traumatic approach for the patient are obvious, and there are also clear benefits in terms of the costs of health care. Procedures that once required long stays in hospitals can now be performed on an outpatient basis. The high power laser, which is increasingly replacing the scalpel, is directed to the site of the operation via single optical fibre (perhaps less than 0.5 mm in diameter) or a flexible endoscope, made up of a bundle of such fibres. The heat generated by the laser beam affects tissue in a variety of ways, ranging from local heating and swelling at the lowest level of delivered energy, to vaporisation and necrosis at the other end of the scale.

Almost all laser surgery via fibre optics is carried out with the NdYAG (neodymium yttrium aluminium garnet) laser, which emits in the near infrared (1064 nm). The most frequent application is probably the control of bleeding from peptic ulcers and other gastro-intestinal lesions. According to a study carried out at the National Medical Laser Centre, University College Hospital, London, by Dr. Stephen Bown and others, only about 11 percent of ulcers sealed in this way bled again, compared with 55 percent in a control group.

The technique involves first finding the vessel that is bleeding (not always an easy task) and then ringing it with a series of six to eight half-second shots from an 80 W NdYAG laser. A major use of lasers is in the treatment and/or palliation of a wide variety of cancers. In the lung, for example, tumours that are occluding the airways of a seriously ill patient can be reduced in bulk to allow easier breathing. This is achieved by directing the beam of an NdYAG laser into the region in question via a special endoscope called a bronchoscope. The tumour is then gradually removed by progressive heating and destruction of its tissues with short bursts of the high power beam.

The debris left by this process can then be viewed through the bronchoscope and picked out of the lung by tiny forceps, which are inserted in a channel running along the length of the instrument. Most of the work on bronchial cancer has so far been done with tumours that lie within the lung, though studies are in progress to remove tumourous masses on the other side of the pulmonary wall. This can be done by passing a single fibre through the wall and inserting it into the tumour. It has been estimated that success with these single fibre procedures will enable palliative laser treatment to be extended to more than half of all lung cancer patients, compared with only 15 per cent at present.

Palliative treatment of cancers of various parts of the gut has also been dramatically improved by the advent of lasers and fibre optics. Blockage of the gullet and inability to eat are distressing consequences of cancer of the oesophagus which the laser can relieve. Work carried out in London by Dr. Bown and others with an NdYAG laser has shown that a passage can often be bored through the oesophageal tumour "without general anaesthesia and sometimes as a day case".

Conventional approaches to the oesophagus involve the forced insertion of a tube, which has the drawback that risks of blockage mean the patient cannot eat solid food. After laser treatment, swallowing "in many cases becomes close to normal and may stay that way for extended periods", according to Dr. Bown. Similar laser techniques can be used to remove troublesome masses in the rectum for patients too frail to undergo surgery. Researchers have found that the laser has the advantage over other ablation techniques, such as diathermy (which requires a general anaesthesia), that it can often be carried out without sedation of any form.

Other cancers that it is hoped to treat with lasers are those of the liver and pancreas, although Dr. Bown emphasised that these are still at the experimental stage. Operative procedures for cancers of both liver and pancreas are notoriously difficult and are associated with high rates of mortality. Surgeons believe it would be a major advance if these organs could be reached and treated without trauma. One way of achieving this might be to deliver a laser beam via an optical fibre, according to Dr. Bown, who has already carried out fundamental work on rats. These studies have shown that necrotic lesions (holes) up to 16 mm diameter can be produced with long exposures (one to 40 minutes) to a relatively low power laser.

Single Optical Fibre. Moreover, the holes gradually close up as healing progresses, thereby offering the possibility of destroying malignant tissue and replacing it with normal tissue. One British company with a major stake in the use of NdYAG lasers in surgery is Pilkington Medical Systems, which manufactures medical lasers and optical fibres. According to its business development manager, Dr. Tony Purdie, the most significant recent advance is the single use or throw away fibre, which Pilkington has just started to market. This has the advantage that fibres do not need to be sterilised before and after each operation, which is a costly and time-consuming exercise and may affect the fibre's optical properties. Moreover, the tips of re-usable surgical fibres are often damaged or degraded which makes it more difficult for the surgeon to deliver the correct amount of energy to successive patients.

Various research teams are exploring other areas of laser surgery, including the clearing of arteries and the destruction of kidney stones. Treatment of stones has been revolutionised by the development of focused ultrasound, which literally crushes them to dust. Some specialists believe the beam of a pulsed dye laser inserted via fibre optics into the urinary tract offers an even better and less costly way of breaking up the stones. Some centres are already using these techniques routinely, according to Vuman, a company that is owned by the University of Manchester, Northwest England and makes pulsed dye lasers specifically for this purpose.

Malignant Cells Destroyed. Another promising medical laser technique that uses a pulsed dye laser is photodynamic therapy (PDT), which is a procedure for destroying malignant tissues with minimal damage to surrounding structures. Research PDT systems are manufactured in the United Kingdom by Oxford Lasers. The PDT patient is first administered a sensitising agent which is selectively absorbed by the tumour. Under the influence of ultraviolet laser light, turned to the appropriate frequency, the agent is then activated to a molecular form that destroys malignant cells. The market for lasers and laser systems of all types has been rising fast. It is estimated that the world sales of industrial lasers will rise at an annual growth rate between 20 to 25 percent.

It is the fervent hope of all humanity that the use of laser be confined only for such healing and industrial purposes and not for star wars and human destruction. -- T.P.S. RAJ

CHEMARENA

S.L. VENKITESWARAN

Foreign Investment in US Chemicals

It is estimated that about one fourth of US Chemical Industry is owned by foreign companies now. By contrast foreign ownership of all industries in USA is only 13%. US owned foreign interests in chemical companies is about the same as foreign ownership in US chemicals -- about $23 billion. There has been a big rise in recent years of foreign ownership in US chemicals, due to the lower exchange rate of $ against £, DM and Yen. The recent major foreign investments in US chemicals as per *C & E News* is given below. The biggest share is of UK at 24% followed by West Germany at 21% and Netherlands at 13% and Switzerland at 9% out of the $23 billion as of 1987. Hoechst's takeover of Celanese is probably the largest and that of Stauffer by Unilever the second. But Stauffer's different sections were sold off to others like ICI, Akzo and Rhone Poulenc. It is difficult to forecast the trend in the coming years but the interchange of ownership may be expected to continue at a lower rate.

The US chemical company which has hit top spot is perhaps Arco with the largest production of propylene oxide along with coproducts styrene or isobutylene --due to their remarkable technology for peroxide-based propylene oxidation. ICI is probably the largest in the world in paints due to their purchase of Glidden of USA while Ciba-Geigy is perhaps the topmost in pigments after their takeover of Du Pont's interests in this area, the result of international takeover.

Internationalising is unavoidable unless a country's policies come in the way or place numerous hurdles in the way. The international investor chooses what items he wants to invest in and not what the country thinks is in its best interests.

We do not expect any open door policy in chemical investments, by foreigners in India, although there has been a lot of liberalisation. Investment in local manufacture helps to overcome tradebarriers imposed by the country. India could have attracted much investments in petrochemicals due to the plentiful availability of natural gas and aromatic rich naphtha but this sector has been more or less the preserve of the public sector.

Recent highlights of foreign investment activity in U.S.

1987

Hoechst completes acquisition of Celanese Corp.
Dainippon Ink & Chemicals completes acquisitiion of Reichhold Chemicals
Mobay acquires Denka Chemical
Courtaulds purchases Porter Paints
Uniliver acquires Chesebrough-Pond's including Stauffer Chemical
ICI purchases Stauffer Chemical from Chesebrough-Pond's but retains only the agricultural chemicals business
Akzo acquires Stauffer specialty chemicals business
Rhone-Poulenc purchases Stauffer basic chemical segment
Henkel acquires former Diamond Shamrock's Process Chemicals Divisiion from Occidental Petroleum
Montedison buys remainder of Hercules interest in Himont.

1986

Air Liquide acquires Big Three Industries
BASF acquires American Enka
ICI purchases Glidden Paint
Rhone-Poulenc acquires Union Carbide's Agricultural Chemicals Division
Sandoz buys Velsicol's agrochemical business
Dainippon Ink & Chemicals buys Sun Chemical's graphics ink unit.

1985

American Hoechst buys Hercules' interest in Hercofina
Henkel Corp. buys 25% of Loctite's stock
ICI buys Beatrice specialty chemical operations
Kemira acquires American Cyanamid's Titanium dioxide division
BASF acquires Celanese Carbon Fibres Division
BASF acquires Inmont
Ciba Geigy acquires Du Pont's pigments business

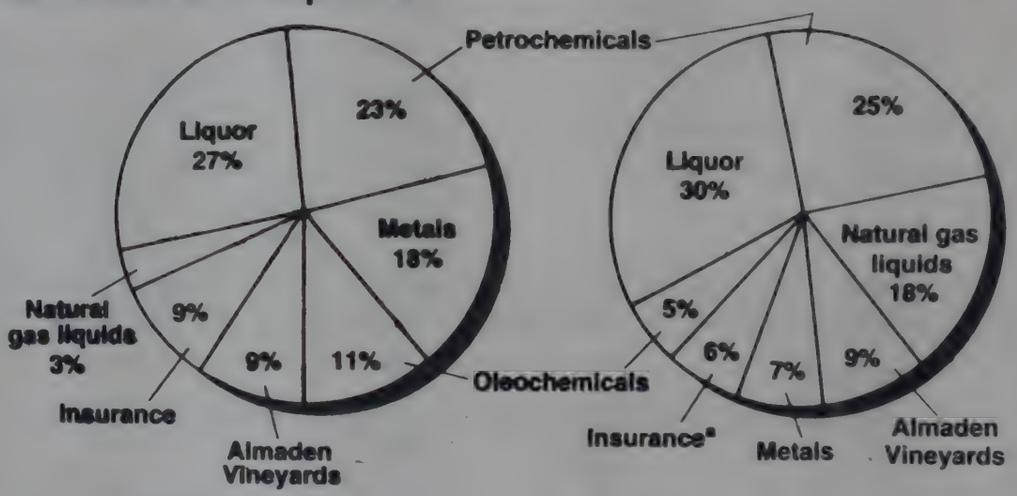
Quantum Chemicals

National Distillers started and flourished with alcoholic beverages but had the wisdom and foresight to diversify into chemicals -- polyethylenes, ethyl acetate, vinyl acetate, acetic acid and oleochemicals. This has paid rich dividends and after years as National Distillers & Chemicals it has now emerged under a new name of Quantum Chemicals, with the ugly linkage to liquors under the terminology of "Distillers" thrown out. (Their business of liquors has been sold off).

The share of chemicals business in sales and profits in 1982 and 1987 are shown in the Figure (from *C.E. News* of 14/3). What a contrast to our own liquor makers who started making power and industrial alcohol (ethyl) and most of them have stayed with it and liquor except perhaps the Mallya group who acquired Hindustan Polymers. Such division between ethanol and chemical producers have been at the source of most of India's problems in this sector.

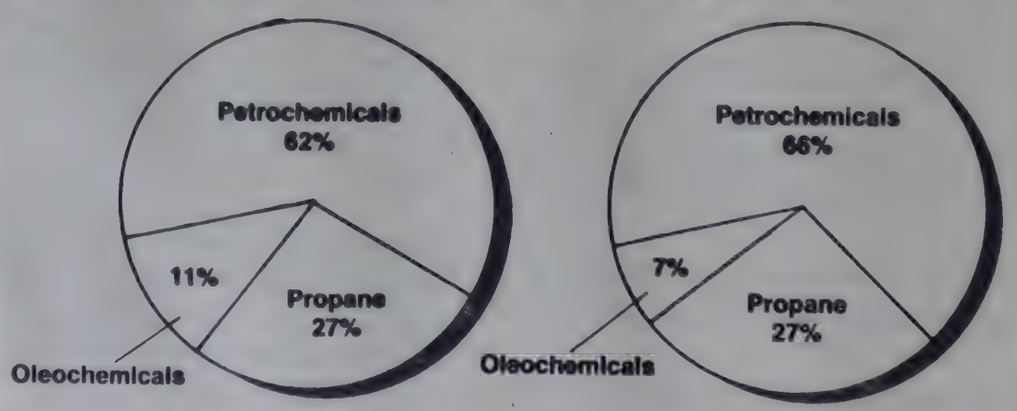
Quantum chemicals have pioneered polyethylene technology of all grades and have one of the best for high density material. It has also acquired other plants such as of Enron and Amoco and will soon reach 1.6 million tonnes capacity. They continue to be the number one in industrial ethyl alcohol and products thereof but their ethylene is all of petro origin. It also is number two in vinyl acetate linked to its acetic acid from ethanol. It had a Taiwan connection in a joint venture for polyethylene but their interests were sold off. Quantum Chemicals has suffered a minor setback due to the Shell plant explosion and cut in ethylene supplies. Their own production of a million tonnes of ethylene is said to meet half of their requirements.

In 1982 petrochemicals and oleochemicals were 34% of sales and 30% of profits ...



Sales = $2.01 billion **Operating profits = $122 million**

...but in 1987 they accounted for 73% of both sales and profits of a more narrowly focused company



Sales = $2.60 billion **Operating profits = $455 million**

Note: 1982 data based on company annual report; 1987 segment sales and profits based on company estimates, and sales from discontinued operations are excluded. a After-tax income.

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Drug wholesalers boycott 6 cos.

The Pharmaceutical trade is at war again. This time it has adopted a strategy of boycotting products of selected drug companies without issuing any formal notice or circular. The boycott is in protest against new trade margins.

Products of six leading drug companies are thus not available in the medical stores in different parts of three states namely Maharashtra, Rajasthan and West Bengal.

In Maharashtra, all the 40 products of Abbott Laboratories are being boycotted by pharmaceutical wholesalers in Bombay and Thane. Boycott of Abbott's products has not however, created any major hardship to the consumers as medicines of other companies are available as substitutes in many cases.

Abbott is a leading manufacturer of erythromycin, an antibiotic, and its formulations in the country with almost 30 per cent of the turnover of the company originating from the sales of these products.

In Marathawada region products of Unichem, Cadilla and Alembic have disappeared from the medical stores. Products of Eskayef are also likely to be off the shelf shortly, informed sources in Bombay say.

In Rajasthan, chemists have stopped buying and selling of all products of Blue Cross Laboratories since last few days. In West Bengal boycott of Glindia (formerly Glaxo) products have been boycotted for the last one week. Informed sources say that this is the first phase of the chemists' stir against the drug companies in protest against reduction of trade margins under the new Drug Price Control Order (DPCO).

The chemists' would continue to boycott products of a selected drug company in a particular region without any formal issue of circulars amongst them, the sources point out.

This, they consider, will enable them to avoid the government action under the provisions of Monopolies and Restrictive Trade Practices Act. A number of MRTP cases are already pending against many chemists' bodies for boycott of different products.

The main grievance of the chemists is the recent reduction of retail trade margin by the government from the originally fixed levels under the new DPCO.

In the 1987 DPCO, the government had fixed a trade margin of 17 per cent of ethical drug formulations and 15 per cent for non-ethical formulations with only three per cent margin for the wholesalers for both ethical and non-ethical formulations.

The trade margin for the retail chemists was only 12 per cent for ethical formulations and 10 per cent for non-ethical formulations with only two per cent margin for the wholesalers in the 1979 DPCO.

The drug industry had strongly objected to the steep hike in the retailers' margin with only a marginal increase in the wholesalers' margin in the new DPCO. In fact many drug units have been paying a wholesalers' margin upto six per cent voluntarily until recently.

Protests from the drug industry had made the department of chemicals and petrochemicals to hold a series of meetings with the representatives of drug industry and trade before the last December meeting, where an agreement was reached finally.

It was agreed then that the retail chemists would be given a uniform margin of 15.5 per cent for all price controlled formulations, a fee of 50 paise for handling each prescription during day time and Re. one per prescription during night.

Instead of implementing this decision the government has changed its decision and fixed a retail trade margin of 16 per cent for all price controlled drugs. This margin will also be on maximum retail price exclusive of excise duty.

Fixing retail margin of MRP exclusive of excise duty would itself bring down the benefits to the retail chemists substantially. One per cent reduction on retail margin for ethical formulations would be yet another blow to the trade as almost 60 per cent of the drug formulations are ethical.

BAN ON NON-IODISED SALT IN DELHI SOON

Edible salt without iodine is to be banned in Delhi shortly.

A notification to this effect will give whole salers three to four month's time to exhaust their stocks of such salt, Delhi administrations, medical secretary Vineeta Rai said.

High incidence of goitre and other Iodine deficient disorders (IDD) in the capital has forced the authorities to take such a step.

Intake of iodine-fortified salt is considered the simplest and cheapest method for controlling goitre and other disorders, the medical secretary said.

A survey conducted by the directorate general of health services had revealed that nearly 30 per cent of the population of the metropolis suffered from IDD. More than three lakh school children were afffected with goitre.

The All-India Institute of Medical Sciences (AIIMS) which conducted a similar survey in the Chandni Chowk area in the walled city and Kalkaji area in south Delhi, found that about 55 per cent of the school children suffered from various iodine deficiency disorders. Another survey by the Institute of Nuclear Medicine and Allied Sciences confirmed that at least 20 per cent school children have various grades of goitre and other IDD.

Mrs. Rai said the matter was discussed with lieutenant governor H. L Kapoor and chief executive councillor Jag Pravesh Chandra a few months ago and it was decided tentatively to ban sale of non-iodised salt in the capital.

Mrs. Rai said the salt commissioner who was also consulted in the matter had assured the administration of sufficient supply of iodised salt to the capital.

According to her, about 1,30,000 tonnes of salt comes to Delhi annually of which 40,000 tonnes is consumed locally while the rest is sent to various northern states.

A national programme for the control of goitre and other IDD through iodisation of the entire edible salt in a phased manner by 1992 is already in progress. The Central government has assured adequate quantity of iodised salt to the endemic areas in the country, including Delhi under the programme.

Mrs. Rai said the administration has already undertaken an intensive publicity campaign against the use of iodine-deficient salt.

The administration was also being assisted by the United Nations Childrens Emergency Fund (Unicef) for conducting workshops and orientation programmes for school health staff.

The directorate of health services, Delhi, had so far organised a workshop and 10 orientation courses for school health staff under the iodine deficiency disorders control programmes.

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Frankly Speaking

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Managing Hazardous Waste

With the ever increasing amount of hazardous waste, a whole new discipline dealing with its management has emerged, and the subject has become important enough to warrant several full length books on the subject. Typical of these is the HAZARDOUS WASTE MANAGEMENT ENGINEERING (Eds : Howard J Martin & James H Johnson, Jr, 528pp, Van Nostrand, 1987) comprising of 8 chapters contributed by experts in their respective fields. The editors, too, have had considerable exposure to environmental and related matters. The headings of the chapters and their respective length in terms of number of pages are:

1. Hazardous waste and chemical substances-statutory review (28)
2. Exposure and risk assessment (44)
3. Chemical, physical & biological treatment of hazardous waste (147)
4. Incineration of hazardous waste (90)
5. Storage of hazardous waste (48)
6. Land disposal of hazardous waste (76)
7. Hazardous-waste leachate management (28)
8. Hazardous-waste-management facility siting (48)

What exactly is a hazardous waste? These include toxic pollutant, hazardous substance and contaminant. In a fitting 8-page introduction, the point is made that it is possible to select the right technology amongst the several available, for any specific hazardous waste. But the book takes a realistic view in identifying two stumbling blocks against immediate application of at least some of the technologies:

- Lack of adequate technical design information, and
- Means for realistic evaluation of the competing technologies

The text, fortunately, particularly addresses to these two problems and provides the available data and information for design purposes and also highlights technologies/techniques which are ready for full scale application. A realistic method for comparing the competing technologies on a functionally equivalent basis is also sought. Hazardous waste management can have one of the possible two objectives:

CONTROL for some period of time, or
DISPOSAL or elimination of hazard potential

This reference volume provides for the first time, at one place comprehensive information regarding technical, regulatory, economic, permitting, institutional, and public policy issues. It also provides a wealth of data and techniques which are now available for analyzing, designing, and developing effective hazardous-waste management solutions. The coverage of the subject in this book reflects the explosive growth in information on this vital subject. Since the 1984 RCRA (Resource Conservation and Recovery Act) Amendments in the USA the choice of prefered technologies has shifted from land oriented ones to those that achieve waste destruction, toxicity reduction, and elimination. In fact, the regulatory limitations now exclude some of the lowcost methods such as landfill for wastes containing dioxins, metals, PCBs and solvents, and hence alternative and more expensive methods have to be used.

Other related and important topics included are risk analysis to support technical decisions; storage as an important interim step in waste disposal as also a summary of some 25 pieces of federal and state regulations, but unfortunately in the US only. Much of the data and material included in this reference is new, some appearing in unpublished reports. Appendices include a wealth of data mostly for applications of technology. To sum up, a most useful text containing all relevant information in ONE place.

PHOTOVOLTAICS:

PAB clears Tata's tie up project

In a controversial move that rejects the recorded views of the Prime Minister's technology advisor, Mr. Sam Pitroda, the Union Government has accorded approval to a joint venture project with foreign tie-up to manufacture solar photovoltaic cells, modules and systems in the country.

The Projects Approval Board (PAB), headed by the Industry Secretary, Mrs. Otima Bordia, cleared the joint venture proposal from Tata Exports and B. P. Solar, a wholly-owned subsidiary of British Petroleum, UK, for production of solar photovoltaic cells, modules and system here, subject to three conditions.

These conditions are: the project has to procure 50 per cent of its total solar cell requirement from domestic sources. It has to undertake an export obligation to the tune of 20 per cent of its annual turnover and, it can pay to BP Solar, UK on export sales up to a limit of seven per cent. There will be no, royalty payment on domestic sales.

The Tata Exports-BP Solar project will have a 40-per cent equity participation from the UK company and the estimated project cost is Rs. 4 crores. It envisages import of the crystalline silicon technology for manufacture of solar photovoltaic cells, modules and systems. With the PAB clearance, the project has got the final approval from the Government and if the project promoters agree to the conditions, they would soon get a letter of intent and other clearances.

But controversy surrounds this project and the manner in which it has been cleared by PAB. For instance, the project will be using an imported technology which is available indigenously and has been utilised effectively by three public sector companies, namely Bharat Heavy Electricals Ltd (BHEL), Central Electronics Ltd, (CEL) and Rajasthan Electronics and Instrumentation Ltd, (REIL).

Moreover, the same project was earlier rejected by various Government agencies on technological grounds and the revised proposal, which has now got the clearance, reflects only minor changes from the one that was rejected.

More significantly, the project is in violation of the Prime Minister's directives on solar photovoltaic technology. Accordng to these directives, no import of solar photovoltaic technology on the basis of crystalline silicon should be allowed as the indigenous capacity in this area is well-established and adequate.

Secondly, tie-up for research and development in the field of amorphous silicon-based photovoltaic technology should be permitted to build the country's capabilities in this area also. The B P Solar-Tata Exports will use imported crystalline silicon technology and hence such imports would be in violation of the PM's directives.

It was around September 1986 that this project was first considered by PAB and was summarily rejected on the recommendations of the Directorate-General of Technical Development (DGTD), the Department of Science and Technology and the Department of Electronics. This application was subsequently referred to the Technology Evaluation Cell, chaired by the then Director-General of DGTD, Mr. P. R. Latey, for further assessment. Once again, it was rejected.

The project was revised marginally and again put up before the Government some time in August 1987. It was then argued that the technology to be imported by the project would be better than the one available domestically. The British company also claimed that it had pioneered in manufacture of solar-powered electronic controls for offshore oil exploration vessels, although CEL and BHEL had been supplying such controls to the Bombay High offshore vessels since the early eighties.

Some Departments in the Government, however, supported this project, while many others opposed it. For instance, Mr. Pitroda had given in writing his views against the project. According to him, import of this technology should not be allowed at a time when the country's domestic companies had done pioneering work in developing reliable technologies and created a market for their products.

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Even BHEL, CEL and REL opposed this move to bring in BP Solar with its imported technology.

These companies argued that after doing pioneering work in this area they had attained success in terms of quality and technology of the photovoltaics they now produce. Their total production is now estimated at 1.3 mw. Apart from installing over 10,000 systems in the country, one of these companies is on the verge of bagging a prestigious solar photovoltaics order from Sri Lanka, after edging out other world giants in this field.

They also feel that India is one of the two largest markets for solar photovoltaics in the world. International companies like Arco Solar and Solarex of the US and Hoxan of Japan are now competing with each other to get a foothold in the Indian market as there is not much demand for such systems elsewhere. Hence, it is argued that the Indian companies which invested a lot in developing this market should be given preference to the imported technologies.

Despite such opposition, the proposal was taken up at the PAB meeting of June 13, although it was not supposed to be included in the agenda as Mr. Pitroda was out of the country and hence was not in a position to attend it. However, PAB decided to discuss this at the instance of representatives of some other ministries like the Finance and it was informally conveyed to the Departments concerned that the decision on this project would be deferred.

Official sources say that at the PAB meeting, it was decided to impose some conditions and clear the project. This was done despite strong opposition from some departments and absence of Mr. Pitroda at the meeting. The export obligation clause, local procurement provision and royalty payment on export sales were these conditions.

Industry observers argue that an export obligation of 20 per cent is meaningless and will be difficult to achieve, since India and China account for most of the market for these systems. Similarly, the local procurement provision would not be feasible, as no indigenous producer of cells would sell its products to the project and deny itself the benefit of value addition by selling the cells as part of a system.

It is thus feared that the project promoters would not be able to fulfil these conditions in practice and at some point of time seek their relaxation. The Government would be obliged to grant those relaxations to ensure the survival of the project. In the process, indigenous technology would get a step-motherly treatment, these sources say.

They also question the justifiability of approving this project just after about three months of the Government's decision to reject another similar proposal, supported by the Commerce Ministry. That proposal was for a 100 per cent export-oriented unit (EOU), to be jointly owned by a combine of Canadian and NRI-sponsored companies and an Indian entrepreneur.

It was to be set up on the basis of imported technology (available indigenously) and import of a second-hand photovoltaic module making plant from Canada. The proposed EOU would have been perpetually dependent on import of cells. The Canadian-NRI combine, which will supply the technology and the used plant, itself set up in 1985 and its sales of photovoltaics was estimated at Rs. 35 lakhs in 1986.

This project was rejected about three months ago on the grounds that the country does not need such technology, which was already available. Also the reliability of the promoters was not established, as the Indian partner had no background in solar photovoltaics.

Meanwhile, BHEL and CEL continue to develop new types of solar photovoltaic systems to meet new application like systems for powering the rural automatic telephone exchanges.

CLEARANCE FOR ANOTHER LAB PROJECT LIKELY

The Union Government will be approving one more project for manufacturing linear alkyl benzene (LAB), in addition to the two LAB projects already cleared by the Projects Approvals Board last week.

The third LAB project will be awarded to one of the two bidders, namely Grasim Industries and Straw Products.

PAB has referred the matter pertaining to the third LAB project to the Department of Chemicals and Petrochemicals with the suggestion that the latter should send a detailed report recommending therein who should be awarded the third LAB project.

PAB will take a view on this issue after it gets the department's recommendation. After a decision is taken on this by PAB, the proposal would be referred to the Cabinet Committee on Economic Affairs for the final clearance.

The two LAB projects, which PAB awarded to Nirma Chemicals Company and Hindustan Lever, will also be referred to the Cabinet committee for final clearance.

As per the PAB decision Nirma was awarded the Visakhapatnam project, while Hindustan Lever was given the Karnal project. The third project is to be located in Mathura near the refinery.

These new LAB projects are expected to meet the demand for this petrochemical intermediate, which will go up to 145,000 by 1989-90. Against this demand, LAB production in 1987-88 was estimated at 40,000 tonnes compared to 30,500 tonnes in 1986-87.

DHARAMSI MORARJI BAGS NIRMA ORDER

The Dharamsi Morarji Chemical Co. Ltd. (DMCC) has bagged an order from Nirma Pvt. Ltd. to set up a 400-tonne per day sulphuric acid plant.

The technology for the plant, to be located at Mandali near Mehasana in Gujarat, will be supplied by another Indian company. The project is expected within 12 months.

According to a press release, this will be the largest single stream DCDA sulphuric acid plant. The scope of the assignment includes supply of knowhow, basic and detailed engineering supply of equipment, fabrication, erection and commissioning of the plant which will also have oleum manufacturing facilities.

Meanwhile, the DMCC will shortly commission the 800 tonne-per-day Pyrites Phosphates and Chemicals Ltd., a public sector company.

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3RD WORLD KEEN ON METKEM KNOWHOW :

USSR may buy polysilicon

The Soviet Union has reportedly approached India for the purchase of high-purity polysilicon, indigenously developed and produced at Metkem Silicon Ltd, even as several countries have evinced keen interest in Metkem's technology.

The extent of Soviet requirement is not immediately available and it is also not clear whether that country has made a firm offer. But, according to informed sources, discussions are already on at the official level, though these are as yet exploratory in nature.

Meanwhile, the success story of this private sector company which, together with two scientists of the Indian Institute of Science, Prof. G. Suryan and Dr. A.R. Vasudevamurthy, developed the indigenous polysilicon technology, has not gone unnoticed outside the country.

Within two years of the plant going into commercial production, several countries, particularly from the Third World, have shown interest in the technology. The Department of Non conventional Energy Sources (DNES) under whose purview the silicon industry falls, has reportedly received several enquiries from Third World countries for the technology, it is learnt.

India is one of the six countries in the world, and the only one from the Third World, which has developed and commercialised polysilicon technology from scratch. The others are the US, Japan, Germany, China and the Soviet Union.

Sources point out that it might take a long time before any of these enquiries are converted into something more tangible and concrete.

But the interest of the Soviet Union in buying Indian polysilicon is a tribute in itself to the untiring efforts of Metkem and the Indian scientists who have been under attack from the Hemlock lobby and must come as a further morale-booster to all those who supported the indigenous technology.

Meanwhile, Central Electronics Ltd (CEL), at Sahibabad which had produced wafers out of Metkem's poly, has awarded bonus points to most of the supplies from the company, in the figure of merit test by which it compared the quality of the Indian product with that of the imported ones.

Bharat Electronics Ltd. (BEL) which had earlier tested the poly for making solar cells and for electronic devices such as TV diodes, has placed an order for wafers made from Metkem's polysilicon.

However, some more "fine tuning" has to be done, to quote the DNES Secretary, Mr. Maheshwar Dayal before Metkem can meet the requirements fore Metkem can meet the requirements of Semi-conductor Complex Ltd. (SCL) at Chandigarh and the Indian Space Research Organisation (ISRO). He is confident that even this will be done soon.

Metkem's present licensed capacity of 25 tonnes per annum of high-purity polysilicon, is just sufficient to meet the requirements of the photovoltaic industry. This can easily be scaled up in tune with the increase in demand. The PV industry needs 1.25 million wafers to produce one mw of power. The present Metkem capacity is required fully to produce 1.25 million wafers.

In addition, the requirements of the electronics industry has to be met, though the quantity is relatively small.

In view of all these developments, Metkem plans to increase the reactor size from the present 2.5 tonnes to 10 tonnes and ultimately to 25 tonnes which will, besides increasing production, also contribute to economy of power consumption and improvement in the quality of the product.

The Rs. 1.5-crore assistance from DNES, for Metkem's research and development will thus be partly spent on the development of bigger reactor. Besides, the R and D unit will keep abreast of developments in crystalline silicon and will work on several scientific ideas for the future development of the silicon industry.

Simultaneously, Metkem has taken up a programme of augmenting downstream operations and upscaling its present facility. The DNES Advisor, Dr. Gururaja, expects this programme of consolidation to be over within a year.

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Decisions soon on DNES participation in Metchem

The Union Government is expected to take a decision in the next three to four months on the proposal for equity participation by the Department of Non-conventional Energy Sources (DNES) in Metkem Silicon Ltd., the country's first and only full-fledged silicon facility at Mettur Dam in Tamil Nadu.

Discussions are on between DNES and the parent company, Mettur Chemicals Ltd., which fully owns Metkem. The present thinking is for something like a 25 per cent participation by DNES, according to its Secretary, Mr. Maheshwar Dayal.

The paid-up capital of Metkem at present is Rs. 1 crore, fully owned by Mettur Chemicals. Should the proposal for DNES participation come through, Mettur Chemicals would increase its equity base in the company. The extent of increase is not yet decided.

Addressing a press conference in Bangalore on June 18, on the eve of the ground-breaking ceremony for Metkem's new research and development project at the company's premises in Mettur Dam, Mr. Dayal said that the proposal for DNES participation in Metkem had been mooted to ensure a closer collaboration between the two.

Besides, Metkem's output mainly served society's needs, as in the solar energy programme, for instance, with which DNES is closely associated. Therefore, it is only logical for DNES to have a stake in the company, according to Mr. Dayal.

Mr. Dayal said that DNES had given a Rs. 1-crore grant to Metkem and a soft loan of Rs. 50 lakhs towards research and development for regular upgrading of the process of polysilicon production, to reduce the energy input in the production process and reduce the overall cost of production. Part of the money had already been released, Mr. Dayal said.

Mr. Dayal, who will break the ground for the new R and D project said that a high-powered committee with representatives from DNES, the photovoltaic expert panel (which is headed by Dr. Sridhar, Director of the Solid State Physics Laboratory), the Indian Institutes of Technology, the Indian Institute of Science and Industry, would monitor the activities of the R and D project. The project would be submitted to both technical and financial audits, according to him.

A time frame of two years has been set for this project. Metkem had earlier submitted the project report to DNES which was scrutinised by the high-powered committee and the photovoltaic expert panel. From the preparation of the project report to its approval it had taken about three to four months.

Prof. G. Suryan and Prof. A.R. Vasudevamurthy, the two scientists who were responsible for the development of the indigenous polysilicon technology, explained to reporters that the primary technical goal before Metkem is to reduce the energy input and in turn, the overall costs. One way to achieve this is to increase the reactor size, from the present 2.5 tonnes to ultimately 25 tonnes.

They pointed out that the photovoltaic industry, the market for polysilicon wafers, is extremely cost sensitive. At present, Metkem consumed about 300 to 350 units of energy per kg of silicon. With the increasing power tariff, the cost of production too would go up. The idea is now to reduce it substantially.

The Additional Secretary in DNES, Dr. Gururaja, who was also present pointed out that even with the present power cost, Metkem's cost is cheaper than that of the controversial Hemlock technology.

Answering a question, Mr. Dayal said that the soft loan of Rs. 50 lakhs had been given to Metkem by DNES through the newly-formed Indian Renewable Energy Development Agency which is authorised to advance loans to the manufacturers, developers, and users of renewable energy systems. An interest of 5.5 per cent would be charged on the loan, he added.

PLASTIC DELEGATION: SMALL UNITS ALLEGE DISCRIMINATION

Some of the associations representating plastic processors, have flayed the Government for inadequate representation in the nine-member delegation, currently out to identify sources for imports of raw materials for plastic.

It is pointed out by a section of the industry that only those associations representing the large units, namely Organisation of Plastic Processors of India (OPP) and the All-India Plastic Manufacturers Association (AIPMA), are in the delegation despite that fact it was the small units that faced problems because of shortage in the domestic markets.

According to a spokesman of the Indian Plastic Federation (IPF), the representation was grossly biased because both OPPI as well as AIPMA were based in Bombay.

In a letter to Mr. L. N. Doshi, Joint Secretary, Department of Chemicals and Petrochemicals, the Federation has sought adequate representation for those units located in West Bengal, Tripura, Orissa, Bihar and Assam.

The federation holds that since the proposed raw material bank was intended for the small units and that the larger units would continue to resort to direct imports, it was only logical, that at least one association representing the small units was included in the delegation.

The latter headed by the Acting Chairman-cum-Managing Director of Indian Petrochemicals Corporation Ltd (IPCL), Mr. J.S. Bakshi would soon be leaving for a tour to some of the South Eastern Asian countries including Malaysia and Hong Kong to book additional supplies of plastic raw material.

Meanwhile, according to industry sources, some of the association based in Western parts of the country including AIPMA was standing in the way of implementing a pool pricing scheme for distribution of imported raw material.

Since most of the larger units would be assured supplies on the basis of their past liftments, it would be the new entrants to the industry which would be hit by shortages, the sources added.

SOLAR VOLTAIC CELLS:

IMFA achieves breakthrough

The Indian Metals and Ferro Alloys Ltd (IMFA) has achieved a major breakthrough in the manufacture of the sophisticated solar voltaic cells indigenously from the basic chip stage.

With this major breakthrough, IMFA has put India alongside the select group of developed nations which possess this "closely guarded technology". The technology to manufacture solar cell chips is possessed by only a few countries such as the US, Japan, West Germany and France.

Solar battery assemblies are made and sold in the country by Bharat Electronics Ltd and a few other public sector companies. However, these companies are merely involved in the assembly of solar chips which are sold in the assembled form.

In the manufacture of solar chips are arranged in a certain configuration on a 10" X 10 plates and several plates of these solar cells are then arranged to form a solar battery.

It may be noted that Indian companies now involved in the manufacture of solar batteries import these solar cell plates and only arrange them to make solar batteries.

Following the breakthrough by IMFA in manufacturing these plates from the chips stage, all manufacturers of solar batteries in the country can now depend on local suppliers rather than importing the components.

Mr. Baijayant Panda, one of the directors of the IMFA group, told "Financial Express" that the company began research programme in the field of alternative energy sources two years ago following its success in "roping in the services of a leading Indian scientist working in the US Dr. O.P. Singhal."

Mr. Panda claimed that the company has invested in the last two years as much as Rs. 3 crores in the project. Exuding optimism over this project, he said that in the next couple of years, solar batteries should contribute at least Rs. 10 crores to the company's annual turnover.

In fact, the company, since its success in making a totally indigenous solar battery, has on a test market basis supplied ten battery sets in the eastern region. To generate one megawatt of power, according to Mr. Panda, using the solar cells, the approximate capital cost would be only Rs. 15,000.

Although the initial capital cost may seem to be high, he said further, the cost of solar power is cheaper than the conventional hydel or thermal power.

The company, which has started manufacturing solar battery assemblies, has even updated its assembly technology so as to manufacture flat plastic covered assemblies which could be mounted on a car roof top to recharge the car batteries.

According to Mr. Panda, the biggest problem in the solar cell technology is the storage of power. Currently, storage of the power generated is possible only in dry battery cells, those used in cars and other automobiles.

In fact, it is owing to the weight of the dry battery cells, the battery assemblies cannot be made in portable sizes for use in rural areas.

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Thin film solar cell breakthrough in offing

A breakthrough in the hi-tech area of amorphous silicon thin film solar cell is in the offing. The development of this technology is one of the eight science and technology missions taken up by the government in 1985. It will bring down the cost of solar cells by nearly 80 per cent.

Dr. Ashok Barua, director, Indian Association for Cultivation of Science (IACS and project director of the mission, told the Economic Times that substantial progress towards the development of materials and technology for the fabrication of amorphous silicon solar cell has already been achieved at the IACS and a breakthrough in its large-scale utilisation is round the corner. A pilot plant is expected to be commissioned by the middle of next year at Gurgaon, Haryana.

The department of non-conventional energy sources (DNES) initiated in December 1983 a Rs. 20-crore project for the development of amorphous silicon thin film solar cell. In 1985 it was made one of the eight S and T missions for the Seventh Plan. The Indian Association for the Cultivation of Science was identified as the lead R and D centre, the other laboratories entrusted with the mission being the Indian Institute of Technology, New Delhi, the National Physical Laboratory and Pune University.

A solar cell is basically a semiconductor device involving P and N type semiconductors. The material widely used till now in India is single crystal silicon The conversion efficiency for this type of solar cell is at present around 15 per cent. In the laboratory more than 20 per cent efficiency has been achieved. However, the cost of producing such a solar cell comes at present to around $5 per cent watt. It is extremely unlikely that costs will decline further than this. This makes the single crystal solar cell prohibitively costly for large-scale terrestrial application such as irrigation supply of drinking water in villages etc.

At present two Government of India undertakings, Central Electronics Ltd., and Bharat Heavy Electricals Ltd., are manufacturing this type of solar cell. Existing production capacity is about two mm per year, and the cells have mainly been used for demonstrations for cultivating awareness of the potential of photovoltaic conversion of solar energy to electricity.

The development of the amorphous silicon thin film solar cell, considered to be potentially the best technology, was needed to make a cost breakthrough. With this technology, the cost per peak watt will drop to one dollar.

Project leader Dr. Barua said the mission goal is that efficiency of the solar cell fabrication in the laboratory should be 13-15 per cent over an area of one cm square. Work on the pilot plant has already begun on a 50-acre area at the solar energy centre at Gurgaon.

Glass Tech, Solar, Colorado, got the contract on a global tender for the hardware. Installation of the $ 5 million hardware will begin by the year-end, and the one mw p.a. pilot plant is scheduled to go on stream by mid-1989, with production targeted around March 1990, Dr Barua informed. BHEL has been given the installation, operation and maintenance job of the plant.

With the successful run of the pilot plant, commercial production is planned with a minimum capacity of 30 mw. Large-scale production will probably begin around 1992 if field trials achieve results.

The technology can later also be extended to thin film transistors, reprography, flat plate display etc. and a sub-group may be set up to develop new devices. The background will soon be ready to achieve new frontiers in material development, the project director stated.

Of the Rs 20-crore project, the pilot plant will be set up at a cost of Rs 10-12 crores, R and D allocation being Rs 5 crores. UNDP has also extended a grant for the mission. IACS has received $2.3 million from UNDP for a five-year period, with a Rs 95-lakh grant from DNES. IACS expects a Rs 4-crore allocation for its R and D work, which figures under the Indo-US S and T initiative programme. IIT Delhi was allocated around Rs 5 lakhs in two phases and Pune University Rs 50 lakhs, Dr Barua said.

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No check on growing pesticide toll

More than 150 persons have died in Jaipur during the past one year after they consumed the banned fumigant pesticide made of aluminium phosphide. The authorities, however, still do not seem to be keen to strictly enforce the ban.

In fact officials of the agriculture department brush aside questions on the issue and claim that "all pesticides are dangerous if taken internally."

The SMS hospital records show that the average age of the victims is 22. Studies in other parts of the country reveal that 37 per cent of the deaths after consumption of pesticide are accidental, while the others have been described as "suicides" or "homicides".

The leading British medical journal, Lancet, recently reported that "hundreds of deaths are caused in northern India due to consumption of freely-available pesticide. Only half a tablet is enough to kill a person within hours.

An ampoule of eight pesticide tablets, manufactured by a Bombay-based company, can be bought for Rs. 10 from many of the agriculture inputs and pesticides stores in the Johari bazar and Ajmeri Gate markets. This is in spite of the two-year-old order which restricts sale of pesticide to the state warehousing corporation and other government grain storage houses manned by experts

If one were to collate all reported deaths caused by aluminium phosphide in the country, the total will far exceed the victims of the Bhopal gas tragedy, says Dr. S. C. Kabra, director (research) of the Sant Khba Durlabhji Memorial Hospital-cum-medical research institute in Jaipur.

Dr. Kabra, who has fiercely opposed the free availablity of pesticides, maintains that the number of deaths reported after consumption of pesticides is a fraction of the number of lives it has actually claimed.

"Most of the cases of suicide and homicide from rural areas are never reported," Dr. Kabra asserts. According to him, such cases in the city hospitals are erroneously recorded as deaths caused by consumption of "some pesticide." "insecticide" and "rodenticide."

At any of the stores in the Johari bazar or Ajmeri Gate markets, which sell seeds and pesticides, the shopkeeper will almost invariably produce the banned pesticide from an obscure corner of his store. The ampoule is already wrapped in a piece of paper, and the customers are not given cash memos. Asked from where he got the product, "shopkeeper pointed out towards the name of the company printed on the ampoule and remarked: "who else."

Another official of the department pleaded anonymity and said the government was not implementing the ban very seriously because pesticide was very effective in strong grains.

PLASTIC FILMS DEMAND TO SHOOT UP

The government's recent directive making it compulsory for manufacturers to pack at least 25 per cent of their edible oil production in smaller packages to prevent adulteration has created a great demand-supply gap for plastic films.

The demand at present was 12,000 tonnes per annum and was likely to shoot up further, according to Mr. H.P. Ranina, chairman of Mazda Packaging Ltd. He was speaking at the inauguration of the company's five-layer film producing plant at Uplat in Thane district near Gujarat-Maharashtra border on June 12.

He said the multi-layer co-extrusion blown film line, imported from Reifenhauser GmbhH, West Germany, was capable of processing varied polymers such as LDPE, nylon, surlyn, primacor, E3VOH, EVA and HDPE. The computerised machinery has a capacity of producing about 200 kgs per hour of the film.

Mr. Ranina further said that the entire project cost of Rs. 5.5 crores was less than the estimated Rs. 5.65 crores. In the first year itself, the company hoped to achieve 90 per cent capacity utilisation and 100 per cent in the second year, he said.

The management expected a profit of Rs. one crore in the first year and about Rs. 3-3.5 crores in the second year on turnovers of Rs. seven crores and Rs. 12 crores, respectively.

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OLEUM GAS LEAK :

Rs. 5 cr. compensation claim against DCM filed

Compensation claims of Rs. 5 crores by 4,600 people affected by the oleum gas leak of December 4 and 6, 1985 from the Shriram Foods and Fertilisers, a unit of the DCM have been filed in four designated courts in the Capital.

The filing was completed by the Delhi Legal Aid and Advice Board on May 31 — the last date fixed by the Supreme Court.

As per the direction of the Supreme Court, the Board, according to its Member-Secretary, Mr. R.C. Chopra, invited claims from all those who had been affected by the oleum gas leak.

About 5,400 claims were received by the Board and after scrutiny they were handed over to a team of lawyers for drafting and filing, Mr. Chopra said.

Mr. Chopra said that the Administrator of Delhi remitted the court fee required for filing claims.

The financial burdens of the claimants were borne by the Board assisted by the Delhi Administration.

The Board, Mr. Chopra said, engaged more than 100 lawyers for preparing and filing suits on behalf of the affected people.

While disposing of a public interest petition, the Supreme Court, in December 1986, directed the Board to invite claims and file them in the designated court.

The court in its landmark judgement had held the management of the DCM absolutely responsible for the oleum gas leak and said that it was liable to pay damages.

The suits filed through the Board can be broadly classified in three categories. The first involving simple claims upto Rs. 10,000 each are by the people who did not suffer physical or mental disability The second category suits claiming an average of Rs. 40,000 each are by the people who suffered minor medical injuries. The last involving claims beyond Rs. 1 lakh each are for those who either died or suffered major physical or mental injuries.

Many of claimants are advocates, litigant public, court staff and judges of the Tis Hazari district courts, which was worst affected by the oleum gas leak.

The designated courts where the claims have been filed are those of Mr. Lokeshwar Prasad and Mr. R. K. Sen, both Additional District Judges, Mr. Brijesh Kumar, Judge, Small Causes Court and Mr. V. K. Malhotra, a sub-judge.

About 2,500 claims have been made over to the court of Mr. Brijesh Kumar while another 2,000 have been assigned to the court of Mr. V. K. Malhotra. The remaining 100 have been divided between the two designated district judges.

The advocates contesting the claims are apprehensive of the disposal of the suits within a reasonable time limit. According to them, the suits are being fixed for appearance next year in the court of Mr. Brijesh Kumar and Mr. Malhotra because of already heavy pendency of cases in their courts.

The advocates alleged that DCM was also adopting delaying tactics and was being allowed to postpone filing of its written statements on one pretext or the other. The advocates are concerned about the long adjournments granted in these cases by the designated court. In some cases the next date fixed is as far away as 1989.

The advocates feel that in order to ensure speedy trial all cases pending before the courts of Mr. Brijesh Kumar and Mr. V.K. Malhora should be withdrawn and assigned to other courts. These two designated courts should be asked to exclusively try the claims.

The advocates are sure of success in these cases in view of the fact that the Supreme Court had already laid the principle of absolute liability of an industry in case of a disaster occurring in its plant affecting the life and property of the people.

The DCM, according to the advocates, therefore, can only contest the quantum of compensation in each case in view of the Supreme Court judgement. Early disposal of these cases would also act as a deterrent against careless handling of hazardous industrial plants, in future.

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Brunette **et. al.** have used 4-acylpyrazol-5-ones in toluene (or chloroform or carbon tetrachloride) to swell cross-linked polybutadiene for extraction of copper from perchlorate medium. This method appears to be promising. (*Solvent Ext. Ion. Exchange,* 1987, **5**,(6), 1017-1030).

Freitas and Cussler have used gels based on copolymer of N,N diethyl acrylamide and sodium methyl acrylate and poly (N-isopropyl acrylamide) for the removal of water from dilute aqueous solution of Vitamin B-12, polyethylene glycols, gelatin, etc. Here the selectivity is based on the size. (*Sep. Sci. Technol.* 1987, **22**(2 and 3), 911-919).

Metal catalysed carbonylations and oxidation-reduction reactions

H. Alper has given a concise account of the use of Rh/Re/Pd complexes as catalyst and cyclodextrin and PEG as phase transfer catalysts for selective reduction/oxidation of carbonyl compounds under mixed conditions. Homogeneous as well as PTC based carbonylations of olefins/epoxides/etc. of acids/esters/lactons, etc. using cobalt or Pt catalysts. Thus, salicylaldehyde can be reduced to ortho-cresol; cyclohexanone can be oxidised to adipic acid. (*Pure and Appl. Chem.,* 1988, **60,** 35).

Fifth SCI process development symposium

A recent issue of Chemistry and Industry (of SCI, UK) [1988, 15th Feb., No. 4, 105-122] covers four paper presented at the Symposium under reference. K. McMohan (of Lonza, Switzerland) has discussed solution of an effluent problem during a scale-up where the gas to be treated consisted of a mixture of CO_2, CHF_3 and CO. After considering different alternatives it was decided to use reaction into porous Al_2O_3 to AlF_3 at 500°C; this allows the emission levels to be met. The second paper by N. Lewis of SK&F is about synthesis of a novel thyromimetic. A. Wright and V. Bramfitt have discussed the development and applications of a CAD package for the batch processing industry. R. Tyson (of Polymer Res., UK) has discussed reolution of gossypol; Sterospecific synthesis of fluorfenicol; Synthesis of 1-bromodiethyl carbonate by photochemical bromination of diethyl carbonate.

Removal of trace level Phenols from Aqueous Solutions via foam fractionation (FF)

Pentachlorophenol was removed from water by FF using cetyltrimethyl ammonium bromide as a surfactant; it was possible to bring down PCP level from 20 ppm to less than 0.05 ppm. (Nyssen G.A. **et. al.** Sep. *Sci. Technol.* 1987, **22,** (11), 2127)

Mycelial Fermentation: Imrpovement by agitator retrofitting

Buckland **et. al.** (of MSD, N.J., USA) have shown, on a pilot-plant scale, that the replacement of standard radial flow Rushton turbines with larger-diameter axial flow Prochem hydrofil impeller significantly improves oxygen transfer efficiency in viscous mycelial fermentations. (*Biotech. Bioeng.,* 1988, **31,** 737).

Two-liquid phase reactor for 11 α-hydroxylation of Progesterone

Geen **et. al.** have used aqueous and a natural oil two-phase reaction system to carry out the transformation under reference with free cells of *Aspergillus ochracens.* High oil ratios are not productive because of poor mass transfer to the concentrated cells in the aqueous phase. (*Biotech. Bioeng.,* 1988, **31,** 743).

Kinetic resolution of racemic allylic alcohols.

Chiral allylic secondary alcohols have been resolved through the strategy of homogeneous hydrogenation catalysed by (R) and (S) -- BZNAP -- Rh diacetate complex. A 67:1 differentiation has been realised. (*J. Org. Chem.*, 1988, **53,** 708).

Fractionation of synthetic polymers with supercritical (SC) N_2O

The T_c of N_2O is 36.4°C and P_c of 71.6 atm. and has a dipole moment. Scholsky and Morgar have shown SC N_2O can be used to fractionate, e.g. poly n-butylacrylate. (*J. Polymrt Sci., Part C. Polymer Letters,* 1988, **26,** No. 2, p. 181).

Esterification of oleic acid with ethanol: Separation of water through membrane

Kita **et. al.** have used a water-permeable membrane to drive an esterification reaction to completion; the removal of water overcomes the thermodynamic barrier. Polyamides, Nafions, etc. were used as membrane material with ethanol to oleic acid ratio of 2:1 to 3:1. It was possible to approach almost cent percent conversion of oleic acid at about 85°C. (*Chem. Lett.* 1987, 2053).

Epoxidation of alkenes with H_2O_2 in a two-phase system: A new catalyst -- quaternary ammonium tetrakis (diperoxo tungstate) phosphate (QATDPTP)

Venturello and D'Aloisio have developed an efficient, versatile and synthetically valuable process where QATDPTD is used as a catalyst in a two-phase system. A variety of olefin, such as dodecene, cyclohexene, n-butyl-3-butenoate, vinyl cyclohexene, styrene, etc. have been used and yields have been typically 80-94%. (*J. Org. Chem.* 1988, **53,** 1553).

Manufacture of pharmaceuticals with homogeneous catalysts

Parshall and Nugent (of DuPont) have shown the utility of homogeous catalyst in making pharmaceuticals/intermediates, including chiral synthesis. As is well known in many drugs only one optical isomer is often required and the second optical isomer could be highly undesirable (e.g. thalidomide -- Here the undesired isomer produced fetal deformaties). The stereoselective synthesis of L-DOPA is the first example cited, followed by thienamycin and Vitamin A. In some cases selectivities are comparable to enzymatic process. (*Chem. Tech.*, 1988, March, 184).

Electro-oxidation of p-tert-butyl toluene (PTBT) in a bi-polar packed bed electrode cell (BPPBEC)

Kim **et. al.** have successfully carried out side chain methoxylation of PTBT in a BPPBEC in which 4.74 x 5mm graphite pellets were used. PTB benzyl methyl ether and PTB benzaldehyde dimethyl acetal are formmed (methanol is used in the process). (*J. Aplied Electrochemistry,* 1987, **17,** 1213).

Precipitated $CaCO_3$ in an ionic water/oil microemulsion

Kandori **et. al.** have used water in oil microemulsions with cyclohexane and calcium salt of 1,2-bis (2-ethyl hexyloxycarbonyl)-1-ethane sulfonate as part of the system. The w/o microemulsions markedly affects the precipitated $CaCO_3$ particle. The solubilization of $Ca(OH)_2$ may also be important. (*J. Colloid Interface. Sci., 1988,* **122,** p. 78).

Unique pore structure of layered catalysts: Montmorrilonite

Suzuki **et. al.** have shown that porous montmorillonite can be prepared to give a sharp pore size distribution with most abundant pore size around 30A°. Here the ion-exchangd of Na-montmorillonite with aluminium chlorohydroxy oligomers has been utilised in catalyst making with polyvinyl alcohol as a modifier. (*J.C.S. Chem. Commun.*, 1988, p. 122).

Solid-liquid phase transfer: Inhibition by excess QAC

A number of solid-liquid reactions are catalysed by PTC; the wellknown classic and original case is that of benzyl esters. Here the beneficial effect of small amount of water has been brought out and the role of the so-called omega phase has been stressed. Now ARRAD and SASSON have shown that an excess of quaternary ammonium compound (QAC) can cause dehydration so well that the reaction rate is retarded. (*J.C.S. Chem. Commun.*, 1988, p. 148).

H_2O_2 production from H_2 and O_2 directly

Recently there has been a lot of activity in this area.

Du Pont have announced their own version. A patent in favour of Du Pont refers to the use of Pd/C to be used in aqueous medium at pressures of 14 to 280 atm. (U.S.P. 4,681,751).

Halcon have claimed that 2-5 wt% Pd/C or SiO_2, suspended in acidic aq. medium can be used. (U.S.P. 4,661,337).

Purification of crude terephthalic acid (TA)

Amoco have claimed that aqueous solution of TA (obtained at higher temperatures and pressures) can be purified well with a multilayer catalyst bed. The first layer is of Group VIII metal/C; second layer of Pd/C and third (optional) layer of Rh/C. (EP 222,500A *cf. Plat-Met. Rev.* 1988, **32,** p. 44).

A new emulsifier

Brock (of IFR, Bristol, U.K.) has come out with a novel polypeptide emulsifer, on the basis of first principles. In the new emulsifiers -- alphahelixes hydrophilic and hydrophobic amino acids are completely separated on opposite sides of the molecules. These amphipathic polypeptides are more effective than natural protein emulsifiers and are expected to be commercially useful for higher value added food and pharmaceutical products. (*Chem. Ind.,* 1988, No. 3 (1 Feb), p. 63).

Water Gas Shift Reaction (WGSR) Co/MnO Catalyst

Gottschalk and Hutchings have shown that WGSR is catalysed by Co/MnO catalyst with high activity and is particularly suited to coal derived synthesis gas. (*J.C.S. Chem. Commun.,* 1988, p. 123).

Purification of glyoxal solution through Reverse Osmosis (RO)

Mitsui Toatsu (of Japan) have claimed that glyoxal, obtained from vapor phase oxidation of ethylene glycol, can be purified through RO membranes (e.g. those based on polyimides) which are capable of removing molecules of mol. wt. greater than 500. Colour improvement is good. (*Chem. Abstr.,* 1988, **108.** 149912).

Chloroacetaldehyde acetals (CAA)

Nippon Syn. Chem. Ind. (of Japan) have claimed that chlorination of vinylacetate in methanol at 0°, in the presence of calcium hyderoxide, gives CAA. (*Chem. Abstr.,* 1988, **108,** 149908 and 149909).

Higher olefins to ketones

Shell have claimed that palladium acetate, with N-methyl pyrrolidone and water and cupric chloride + 2,3,5,6 tetramethyl benzoquinone, allows octene-1 to be conferred to 2 octanone with more than 95% selectivity. (EP 237,108, Sep. 87, *Chem. Abstr.,* 1988, **108,** 149915).

One-step Synthesis of propyl gallate (PG)

A bio-chemical route has been developed in Israel by Dr. Barzilay where cheap hydrolysable tannin is transesterified with *n*-propanol. Here a two-phase system is used and the enzyme is tannase which can also be immobilised. Final purification is by crystallisation of PG from the solvent. (*Chem. Britain,* 1988, Feb., 105).

Synthesis of monochloroacetic acid (MCA)

Salmi **et. al.** have given a kinetic model for liquid phase chlorination of acetic acid, with acetyl chloride (which is also formed as an intermediate) as catalyst. The acid catalysed enolization of acetyl chloride is the rate determining step. Temperature upto 110°C was covered. (*Chem. Eng. Sci.,* 1988, **43,** 1143).

Flue Gas Desulphurization (FGD)

In U.K. steps are being taken to put FGD units to cover 2000MW power generation based on coal by 1996. Before the turn of the century CEGB will invest one billion pounds for acid gas removal. World over about 90% of FGD use lime or limestone. In these cases the product is eventually high quality gypsum which can be used for a variety of purposes. The flue gas first goes through electrostatic precipitators and then to different types of scrubbers.

The Mitsubishi Heavy Ind. uses a co-current flow of flue gas and limestone slurry. For a 2000 MW plant the capital cost will be about £200m; running cost will be about £25/35 million and will need about 300000 tpa of limestone and produce 560000 tpa gypsum. (*Process Engg.,* 1988, Feb., p. 37).

3-Methyl-1-butene (MB) from isoprene

MB is a monomer as well as an intermediate for agrochemicals; it can be made by selective hydrogenation of isoprene in the presence of a catalyst based on Co(II) acetyl acetonate, Ph_3P, PhCl, Et_3Al and $Al_2Et_3Cl_3$. (J.P. 62,108,827, May 1987; *Chem. Abstr.* 1988, **108,** 149887.

Alkylation of para cresol (PC) with isobutene (B)

Santacesaria **et. al.** have studied acidic ion-exchange resin (Amberlyst 15) catalysed alkylation for the *mono* and *di-* stages. Kinetics was studied in a slurry reactor. Temperature was varied upto 70°C. (*Ind. Eng. Chem. Res.*, 1988, **27,** 841-548).

HI by the reaction between H_2S and iodine dissolved in iodide solutions

HI can be made by absorbing H_2 in iodide solutions containing dissolved iodine when sulphur precipitates. It has been demonstrated that the main reaction followes instantaneous reaction kinetics but the presence of colloidal sulphur in the diffusion film can lead to a marked enhancement in the rate by a factor as high as 8. (*Chem. Eng. Sci.* 1988, **43,** 1071).

Highly selective *para* chlorination of phenol and anisole

Lindsay Smith **et. al.** have shown that highly efficient *para* chlorination of phenol and anisole can be conducted with N-chlordialkylamines and N-chloro trialkylammonium salts in trifluoroacetic acid medium at room temperature. This reaction can also be carried out in aqueous sulphuric acid. (*J.C.S. Perkin-Trans,* II, 1987, No. 10, 1533-1535).

PTC in Pd extraction by 1-(2-pyridylazol-2-naphthol (PAN)

Al-Bazi and Freiser have shown that the rates of extraction of Pd from chloride solutions by PAN are markedly enhanced by using PTC (Q^+Cl^-; Q^+SCN^-) (Q^+ = Tetraheptylammonium). (*Solvent Extr. Ion Exch.* 1987, **5** (6), 997-1016).

Purification of wet process phosphoric acid (WPA) by solvent extraction with propyl ethers

Ruiz **et. al.** have shown that dipropyl ether (as well as mixed propyl ethers) is a good solvent for the purification of WPA. This system exhibits three liquid phases with 65.7% PA in the aqueous phase, 43.9% in the heavy organic phase and 4.3% in the light organic phase. This ether solvent is superior to iso-amylalcohol. (*Solvent Extr. Ion Exch.* 1987, **5** ((6), 1145-1150).

Ultrasonics (US) in Barbier reaction (BR)

The BR of benzaldehyde, *n*-heptyl bromide, and Li was affected by US and the rate of formation of l-phenyl octanol depends strongly on the intensity of the US waves and the temperature. An unusual variation in the rate with temperature was observed and mass transport resistance was absent. Electron microscopy examination of the metal reveals the very important role of the acoustic waves, through cavitation phenomenon. (J.C. deSouza-Barboza **et. al.,** *J. Org.Chem.*, 1988, **53,** 1212).

Ultrasonics: Sonoluminescence (SL)

K.S. Suslick, who has contributed a lot in sonochemistry, has, for the first time, obtained SL spectra from hydrocarbon and halocarbon liquids. Acoustic cavitation results in several benefits; "hot spots" can exceed 5000°C. Suslick has also found that the US irrdiation of Ni powder increases its activity as a hydrogenation catalyst by a factor exceeding 10^5.

Solvent extraction of phenol/acetic acid/ethanol from aqueous solutions: A liquid phosphine oxide as a solvent

Watson **et. al.** (of Cyanamid, Canada) have proposed a new liquid phosphine oxide which is a mixture of four trialkyl phosphine oxides (R_3PO) in which each R group is either *n*-hexyl or *n*-octyl, which can be used at a conc. as 2.3M (twice that of TOPO -- trioctylphosphine oxide), for the extraction under reference. The values of distribution coefficients for phenol, acetic acid and ethanol are 1.6, 1.0 and 0.9 respectively. (*Solvent Ext. Ion Exchange*, 1988, **6,** 207).

MANUFACTURE OF LAB :

HLL, Nirma, Grasim get go-ahead

Hindustan Lever, Nirma and Grasim have been given the go ahead for setting up units to produce linear alkaline benzene (LAB), a critical raw material for the manufacture of detergents. Each of the units is to have a capacity of 60,000 tonnes per annum — the minimum viable capacity as fixed by the authorities.

The Nirma unit is to be set up at Vizag, that of Grasim at Mathura and of Hindustan Lever at Karnal. The raw material for the production of LAB being kerosene, the LAB units have to be situated near the refineries. There are already refineries at Mathura and Vizag and, as is known, Indian Oil and Tatas are assigned the job of setting up a refinery at Karnal.

There are three existing LAB manufacturers in the country — PCL, Reliance and Tamil Nadu Petrochemicals, a joint sector project of Tidco and Spic, IPCL, intially, had a capacity of 30,000 tonnes per annum, which has been now raised to 60,000 tonnes per annum.

It is interesting to note that of the six producers — three already in production and the three up-coming units — only two, Hindustan Lever and Nirma, are the two biggest consumers of LAB in the country, while the other four are only the producers of the commodity and its suppliers to the users. At present, Hindustan Lever and Nirma are totally dependent on the three indigenous producers with the banking of imports with the rise in the indigenous capacities.

The need for more LAB projects has been felt because the demand for detergents has been rising at an accelerated pace from an annual growth of about five per cent a year ago to the present rate of growth of 15 per cent annum.

In fact, the demand projections for the Seventh Plan for detergents are said to have already been surpassed, indicating the rising demand for demand for detergents among the users. Yet, the consumption of detergents, it is said, in India is meagre around two kg per capita against six kg in countries like Malaysia, Argentina or Brazil.

The picture looks more contrasting if the consumption of detergents is compared between the developed countries and India. In those countries almost 99 per cent of cleansing agents comprise of detergents against only one per cent use of soap whereas in India about 60 per cent of the users depend on soap and the rest on detergents.

As such, the setting of three more LAB units ensures the supply of detergents to match the growing demand in the country, according to industry sources.

The outlay on each of the new projects is put around Rs. 180 crores. It is interesting to note that Hindustan Lever had mooted the idea as far back as 1985 when the outlay on the projects had been put at about Rs. 130 crores. Now, this cost has escalated by Rs. 50 crores

Again, unlike the other two projects, HLL's is the only one which has not got a ready refinery. The Karnal refinery is yet to commence construction work, whereas the Vizag and Mathura Refineries are already in operation. The LAB units attached to these refineries only have to be set up to tap their feedstock from the refineries.

HLL may undertake the task of setting up its own plant even as the refinery is coming up at the site. It is also to be said that HLL, with the backing of Unilever available to it in its technological and other needs, may be able to do a fast job of putting up of the LAB unit. After all, its plans for such a project have been hibernating for the past three years.

Nirma, the largest detergent manufacturer in the country with an annual turnover of over Rs. 300 crores per annum, is still a closely held company. It is to be seen whether the company will go public to mobilise the massive resources needed for the new project. Grasim belongs to the Aditya Birla group and the new LAB project has become one more large project in a string of such projects being set up by the group, including the Indo-Gulf Fertilisers, and the refinery at Mangalore jointly with Hindustan Petroleum Corporation.

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HDPE sack units future bleak

The plastic sacks (HDPE) industry in the country is facing an uncertain future following the Government order making it compulsory the use of the jute bags for packing certain commodities.

The order, passed in May 1987, has already taken a toll of 200 small-scale units, out of a total 500 units in the country, which have been rendered unviable. In Tamil Nadu alone, 30 units out of a total 70 have been closed down and the rest are operating at 30-40 per cent capacity. Almost all the units are run by young technocrats.

Before the order was passed, the plastic sacks industry was having a share of 15 per cent in the total packaging requirements of the country. While cement and fertilisers were packed in plastic bags, foodgrains and sugar, which needed 85 per cent of the entire packing materials, were left to the jute industry.

The 15-per cent share was sufficient to take care of the full installed capacity of 1.6 lakh tonnes a year of the plastic sacks industry. But the order has made the use of jute bags mandatory for 70 per cent of cement and 50 per cent of fertilisers, thus taking away another ten per cent of the plastic sacks market share.

According to Mr. Ramesh Jain, President, All-India Flat Tape Manufacturers Association, the order is the result of a wrong propaganda mounted by the 'strong jute lobby'. He also termed it a politically motivated' decision coming as it did in the wake of elections in West Bengal.

He told newsmen in Madras recently that the HDPE bags industry was given a big fillip by the Government in 1984-85 following successive jute crop failures. The next year, DGTD registered capacities totalling 10 lakh tonnes of which 1.6 lakh tonnes have been installed till now with an investment of over Rs. 500 crores.

The trouble for the industry started in 1985 when there was a bumper crop of jute leading to a glut in the domestic market. The jute lobby became active with the result that the HDPE industry was subjected to 'harassment' in the successive Union Budgets.

Mr. Jain pointed out that since jute crop is prone to fluctuations, no realistic projections could be made based on it, In fact, the D. V. Kapoor committee has calculated a staggering supply demand gap of 2600 million packing sacks by 2000 A.D.

He also questioned the view that the order is meant to help the jute growers. As a matter of fact, while the price of jute bags have been going up the price of raw jute have remained more or less stagnant. The Government move has benefited only a handful of large houses, he alleged.

Apart from the HDPE industry, other consuming industries like cement and fertilisers have also been affected by the Government order, Mr. Jain noted The end-users also stand to lose heavily on account of seepage, pilferage and humidity problems that go with jute bags.

According to an estimate made by the Institute of Packaging, the country was losing as much as Rs. 500 crores a year because of these shortcomings of jute bags, he said.

Mr. Jain warned that if the order continues to be operative for another year, the whole capital base of the industry will erode affecting nearly two lakh people employed directly and indirectly by the units. In Tamil Nadu, over 14,000 people depend on this industry for a living.

ACCORD ON INTERIM RELIEF FOR TANNERY WORKERS

The threatened strike from recently by nearly 50,000 leather tannery workers in Tamil Nadu has been averted by a settlement reached in Madras on June 17, between the unions and managements.

The accord, concluded before the Joint Commissioner of Labour, Mr. P. Lakshmanan, provides for the payment of Rs. 90 per month to each worker as interim relief with effect from January 1 this year. Earlier, the managements' offer was Rs. 60.

A joint press statement issued by the unions said the general demands and other issues are to be resolved through direct discussions.

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Team spots 3.15 lakh tonnes of polymers for import

The latest plastic hunting expedition led by Mr. Lalit Doshi, Joint Secretary, Department of Chemicals and Petrochemicals, has been able to locate some 3.15 lakh tonnes of polymers from manufacturers in three continents.

Ironically, the news has not gladdened the industry. Unless the Government acts in time to prune the high rates of import duties, imports at the existing prices will create more problems than it solves, according to small-scale entrepreneurs who form the backbone of the industry.

The delegation, consisting of the joint Secretary, Indian Raw Material Manufacturers, chiefs of NOCIL, PIL, and IPCL, and representatives of processors called on major producers in Europe the US and South America.

The team, it may be noted, has only located possible sources of supply of vital polymers like HDPE, LDPE, PVC and PP to the tune of 3.15 lakh tonnes. Their import would call for fresh initiatives on the part of the Government. Out of 3.15 lakh tonnes some 56,000 tonnes could be imported in 1988 and the rest of 2.58 lakh tonnes should come in during 1989.

The bulk of the material, some 162,000 tonnes, is from European suppliers. American manufacturers have promised about 80,000 tonnes and the balance is to come from South America.

The prevailing international prices explain the dismay of Indian processors. Interestingly, the export prices of overseas suppliers are much higher than the domestic prices in these countries. The current export prices are: LDPE $ 1500, HDPE $ 1400, $ 1225 and PP $ 1350.

The landed prices of these materials at the prevailing rates of import duty, it is feared, may slow down the 15 per cent growth of the Indian industry, which is amongst the highest in the world. The current import duties are as follows: LDPE 38.5 per cent plus Rs. 2600, HDPE 114.5 per cent, PVC (suspension and emulsion grade) 40 cent plus Rs. 4000, paste and battery grade 60 per cent plus Rs. 8000 and polypropylene (PP) 95 per cent.

Most European and US suppliers are happy with their stable home markets and are not keen on seasonal export orders. Hence the higher export prices. Members of the Indian team tried to convince suppliers that India would require imports for the next 10 to 15 years and that it would be in their long-term interests to enter into a deal

Several suppliers are said to have told the delegation that they hate the Indian system of floating tenders. "We don't even know who we are dealing with," they complained. Western suppliers are accustomed to after-sales service and association with end-users in polymer applications.

A few reputed polymer manufacturers have shown interest in long-term tie-ups with India. Another discovery was that Latin American countries like Mexico and Brazil have surpluses to spare.

The tour has enabled the Indian industry and the Government to acquaint themselves with the world polymer scenario. The industry hopes the Government has realised that the kind of of import regime obtaining in this country exists nowhereelse in the world. The Government, on the one hand, has identified plastics as a thrust item and, on the other, still levies penal duties.

It has also accepted the suggestion of the development council for the petrochemical industry for floating duty rates adjustable to rise and fall in international prices. Following this, a panel of top officials was set up to monitor import duties on polymers. Though two months have passed, no action has been taken on restructuring duties.

If the Government does not act expeditiously, the industry fears that glass, metal and wood may reappear in fields where they have already been substituted by plastics. A good example is reusable glass bottles for milk distribution which has resurfaced in Bombay in the wake of rise in the price of polyethylene (LDPE) milk pouches.

MEKA PETROCHEM SETTING UP BOPP FILM UNIT IN AP

Meka Petrochemicals Ltd. is setting up a bi-axially oriented polypropylene (BOPP) flexible packaging film unit in East Godavari district.

The unit, with a capacity of 1200 tonnes per annum, will have a capital outlay of about Rs. 15 crores. It will be set up at Murari, 25 km from Rajahmundry.

The demand for BOPP film in 1984 was 1540 tonnes. It increased to about 2400 tonnes per annum in 1985-86 and to more than 3000 t.p.a. in 1986-87.

The expected growth rate of demand is placed at 35 per cent. The demand is projected around 26,000 tonnes by 1995 for non-electrical grades against the total approved capacity so far in the country of 20,300 tonnes. This will leave a supply gap of 5700 t.p.a.

Meka Petrochemicals proposes to have an inbuilt provision in its project for PVC coating and metallisation of BOPP film. The metallised film has substantial uses in the industrial sector. This will make the unit economically viable.

The main raw material required for the manufacture of BOPP film are polypropylene granules and additives. These are available from IPCL and as such, no raw material constraints are envisaged.

COAL PRICE HIKE RULED OUT

Union minister of state for energy Jaffer Sheriff has ruled out the possibility of any rise in the cost of coal as a concerted move was being made to reduce the cost of production in the coal sector.

He said that an action plan had been drawn up for conservation of energy and providing consumer satisfaction by improving the quality of coal. He stressed the need for far greater exploitation and utility of coal in the interest of national economy.

Mr. Sheriff also ruled out the possibility of shifting the head quarters of Coal India from Calcutta.

Aluminium import at in standstill

Imports of aluminium by the Minerals and Metals Trading Corporation (MMTC) has come to a standstill during the last six months, the Union government has not conceded MMTC's demand for reimbursement of losses involved in the import as international prices of the metal have gone up sharply during the last few months.

The government's indecision is curious at a time when there is a shortage of aluminium in the country and imports in the present situation cannot be effected to provide relief to user-industries. The government has neither reduced the import duty on aluminium nor has it told MMTC that it would be reimbursed for the losses.

According to the latest reckoning, import of aluminium would cost MMTC about Rs. 65,800 per tonne. This includes basic import duty, countervailing duty and other charges. Against this, the price of aluminium fixed under the aluminium control order is Rs. 28,482 per tonne. Thus there will be a loss of about Rs. 37,000 per tonne to MMTC, informed sources say.

In other words, if the corporation imports say about 10,000 tonnes, it is expected to suffer a loss of Rs. 37,-000 per tonne.

Since there is a substantial gap between demand and supply of aluminium, a vital input, it was suggested by MMTC about five months ago, that imports should be allowed and the losses reimbursed. At that time, the international price of aluminium was considerably lower.

The present annual demand for aluminium is around three lakh tonnes. Against this, indigenous production is about 2.5 lakh tonnes. Thus there is a gap of nearly 50,000 tonnes. Indigenous output has been hit by power shortage.

A serious problem has, therefore, been created for actual users. The government is understood to have not made up its mind so far as de-control of aluminium prices is concerned.

Any de-control will result in a sharp rise in the prices of aluminium in view of the shortage of the metal, thus badly affecting actual users. Producers, of course, will benefit.

In order to improve the overall availability of aluminium, the government should take an early decision on reimbursement of losses to MMTC or on revision of the duty structure, the sources point out.

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LAST DATE FOR RECEIVING SUBMISSIONS EXTENDED TO SEPTEMBER 30TH 1988.

Call for ban on toxic pesticides

The Planning Commission Member, Dr. Y.K. Alagh, urged the Government to ban the use of pesticides which are highly poisonous "in a phased manner" if not all at the same time.

He noted with concern that while advanced countries including the US and the UK have banned the use of pesticides like aldrin, BHC/lindane, DDT, dieldrin, endrin and heptachlor, "India is still using most of them."

Dr. Alagh was inaugurating a national seminar on the changing pest situation in the current agriculture scenario of India.

He said the philosophy behind pest management is not just extermination but economical utilisation of pesticidal chemicals with the least ecological damage.

Although 35 per cent of the pesticides produced in the world are consumed in North America and another 35 per cent in Western and Eastern Europe, nearly 75 per cent of the total deaths in a year from pesticides poisoning take place in developing countries which consume only 21 per cent of the total pesticides, Dr. Alagh said

Dr. Alagh said that despite the limited coverage of crops by pesticides in India, the problem of residue has assumed significant proportions.

He regretted that a scientific approach to the application of pesticides is lacking in Indian farmers to a large extent. The farmer is seldom exposed to proper application practices and training in the safe handling of pesticides with optimum economic advantage to himself and maximum protection to his crops.

Application of pesticides is mostly undertaken by hired farm hands employed temporarily from season to season. Because of the migratory nature of the labourers, no training programme can be organised for them.

In this respect, Dr. Alagh emphasised, total utilisation of communication media like radio and television is necessary. The film division should also introduce this aspect of public education through their network.

Knowledge about the safety aspects of pesticides should be pooled. Development of a country-wide network of well-equipped and staffed laboratories, both under the Government and private sector, to undertake quality control of pesticides as well as regular monitoring of their residues in man and the environment is an urgent need.

Safety with pesticides can be best achieved by sustained imaginative effort by the Government supported by industry and the users themselves. While the penal provisions are a help, they are essentially meant for, those who, in spite of awareness and means, defied the prescribed quality and safety norms.

He pointed out that when the country is facing an acute shortage of oil seeds, the problem is aggravated by the damage caused to rapeseed and mustard by white rust alternaria blight.

To prevent many crop diseases, supply of health seed is vital. There is need to strengthen disease-free seed production programmes, he stressed.

IPCL KEEN ON VIZAG NAPHTHA CRACKER UNIT

Indian Petrochemicals Corporation Ltd (IPCL) has evinced keen interest in participating in the naphtha cracker unit proposed to come up during the Eighth Plan. An official seven-member, Japanese team belonging to Mitsui Ltd along with IPCL representatives was in Hyderabad on June 17, to hold discussions with the Andhra Pradesh Government on infrastructure availability for setting up the giant unit at Visakhapatnam.

It is understood that the Japanese firm is willing to raise huge foreign assistance to IPCL.

It may be recalled that the State Government was keen that the naphtha cracker unit should come up at Vizag, on the east coast, to serve the southern region effectively. A high-level committee of the Government had already studied the prospects for the unit at Vizag and subsequently measures were initiated to attract investments in downstream industries.

The application for a letter of intent on the naphtha cracker unit at Vizag by APIDC is awaiting Central clearance.

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Aonla fertiliser complex goes on stream

IFFCO's prestigious Aonla Fertilizer Complex, engineered and constructed by PDIL, has been successfully commissioned as per schedule within 36 months from the zero date. The plant has been designed to produce 1350 M.T. of Ammonia and 2,200 M.T. of Urea per day. Ammonia plant is laid in single stream while Urea in two streams. The natural gas from HBJ pipeline was taken in the Reformer on April 10, 1988 and Ammonia production achieved on May 14, 1988, which in itself is a record.

The feed in the Urea Reactor was taken in on 17th of May this year and production started from 18th night. This is an achievement for PDIL and all engineeers and staff of PDIL are proud of it. The execution of the project called for close monitoring of engineering and procurement activities careful and calculated strategies in transportation of heavy consignment over rough terrains and waterways, adoption of latest network techniques and systems using computer for expediting following-up construction monitoring, quality control and stores management. Emphasis was laid on maximum utilisation of available resources within the country so as to achieve cost reduction and development of indigenous technology and manufacturing facilities.

The plant has been designed to achieve stringent standards laid down by Pollution Control Boards and environmental agencies. In addition, the various problems encountered during construction and commissioning of similar plants in the past were studies, analysed and incorporated in this project to achieve optimum design and stream efficiency in performance.

The successful completion of this project in a record time of 36 months constitutes another landmark reflecting PDIL's capabilities in project management, design, engineering and construction of large capacity single stream fertilizer projects.

BIFR PLAN TO REHABILITATE PUNJAB FERTILISERS

The Board for Industrial and Financial Reconstruction (BIFR) has prepared a scheme for the rehabilitation of Punjab National Fertilisers and Chemicals Ltd, which has been declared a sick company.

The company, which has a paidup capital of Rs. 14.82 crores, has accumulated losses worth Rs. 16.62 crores.

Total cost of the rehabilitation scheme is estimated at Rs. 18.24 crores. The scheme envisages reliefs and concessions, some of which are beyond what are considered normal. These have been provided taking into account the importance of the products, ammonium chloride and soda ash, manufactured by the company, the location of the plant in the submountainous region of Punjab, and the employment situation in a sensitive border State.

Under the scheme, the Punjab State Industrial Development Corporation (PSIDC) will provide fresh funds to the tune of Rs. 2.42 crores on an interest-free basis to be converted subsequently into equity.

The financial institutions will provide term loans totalling Rs. 3.31 crores and reduce the interest rates. The banks will give term loan of Rs. 1.77 lakhs on concessional terms.

The National Fertilisers Ltd has agreed to waive the interest due from Punjab Fertilisers provided the principal amount is refunded by the company in a lump sum within a period of 60 days.

As a special case, the Punjab Government has agreed to waive sales tax, purchase tax and electricity duty up to 1997. In addition, the PSIDC has agreed to give a guarantee in respect of extra assistance to be given by the banks.

Though the Housing and Urban Development Corporation (HUDCO) has already invoked the bank guarantee for the realisation of its dues from the company, it was agreed to re schedule the payments to be made by the Punjab National Bank (PNB). PNB is also making a proposal to HUDCO requesting rescheduling of liabilities to the maximum extent possible.

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CSIR for closing down Bhopal RRL

Madhya Pradesh may soon be deprived of its only regional research laboratory (RRL).

Ironically, the Council of Scientific and Industrial Research (CSIR) has decided to close the RRL, located at Bhopal, on the basis of a review committee report for 1986 when the establishment was poised for a take-off.

RRL, one of six such laboratories in the country, was proposed in 1981 since the State had no such CSIR establishment.

The laboratory started functioning in 1984 and according to RRL scientists, began earning profits last year at the rate of 15 per cent of investment.

According to scientists at the laboratory even the take-over of RRL by the Bharat Heavy Electricals Ltd. (BHEL), may not save the laboratory since BHEL's area of operations is too narrow as compared to the vast diversification of specialisations at the laboratory.

Consequently, not only would Madhya Pradesh lose Rs. 7 crores worth of equipment to BHEL, where most of RRL's existing facilities are not required but also facilities available to the industries in the region for research based on local conditions.

Sources pointed out that the CSIR review committee Chairman, Mr. Abid Hussain, a member of the Planning Commission, is the only CSIR functionary to have visited RRL way back in October 1986 though Mr. Hussain, a non-technical person, praised the work at RRL, the Hussain Committee report submitted to CSIR was highly critical of RRL. No other CSIR functionary had reviewed or visited RRL ever since, they said.

The report, submitted on December 31, 1986, said "RRL, Bhopal, was yet to evolve at an adequate level, CSIR should explore the possibility of the State Government taking it over and running it as a State laboratory. Central Government assistance could be considered for its takeover and operation for a limited period. If this was not possible, then it should be closed down."

The report came to the knowledge of the 110-strong RRL staff, including scientists in March last year. Shocked, they wrote to the CSIR Director-General, Dr. A. P. Mitra, recounting their achievements, but to no avail.

Again, on December 1 last year, they wrote a letter to Mr. K. R. Narayanan, Union Minister of State for Science and Technology and Vice-President of CSIR society, the apex body headed by the Prime Minister, Mr. Rajiv Gandhi.

In response to this letter, Dr. Mitra informed RRL that the CSIR governing body had agreed not to close down the laboratory and a final decision would be taken by the CSIR society.

The CSIR society, at its February 2 meeting this year, however, approved of the closure.

A CSIR release said "The society felt the purpose of RRL could be more usefully served by linking it appropriately with an industry, like BHEL, Bhopal.

The society's decisions were officially communicated to RRL, Bhopal, in mid-way prompting the scientists to telegraphically register their protests to those concerned, including the Prime Minister.

Scientists, interviewed by UNI, said Mr. Hussain's report may have been based on the alleged "lacklustre" period during the directorship of Dr. P. K. Rohatgi, who had resigned in August, 1986, Mr. Hussain visited RRL in October.

The present Director, Dr. Rajendra Kumar, took over in December 1986 after which the laboratory was given fresh impetus to start new research programmes.

CONSERVING OIL

The Union Petroleum Ministry appears to have resigned itself to the inevitability of rising oil imports and a substantial foreign exchange outgo on this account year after year. There is little evidence of effective conservation. Domestic consumption is growing at an annual average rate of 6.4 per cent. This is a rate that the country can ill afford, given the difficult foreign exchange position and the size of the trade deficit during the first three years of the Seventh Plan. There are objections on populist grounds to frequent hikes in petroleum product prices, but this is a course that is simply unavoidable to restrain consumption growth. The Government also views the upward revision of petroleum prices periodically as a means of fiscal support. Pricing is only one aspect of oil conservation. Fuel efficiency is quite as important. A beginning has been made in fuel efficient vehicles as well as industrial machinery. But more needs to be done, especially in industrial boilers and co-generation, if substantial economies are to be made in oil imports.

The first three years of the Seventh Plan indeed have been one of stagnation in oil production. From a peak of 70 per cent in 1984-85, the terminal year of the Sixth Plan, the ratio of domestic oil production to consumption is poised to drop to 60 per cent by 1989-90 and still further to 57 per cent by the close of the Eighth Plan. Meanwhile consumption has grown at a very fast rate. It would be wrong to blame it all on the extra movement of vehicles for drought relief. A crucial factor has been a want of urgency in regard to oil conservation. Only recently, it was reported in this paper that the target of production of petroleum crude would be 46 million tonnes by 1994-95. This represents a jump of 11.47 million tonnes over the projection for 1989-90. But much of this effort will be wasted if inefficiency in the use of oil (and other forms of energy) continues.

— **Financial Express**

RAJAT BAKSHI NEW STC EXECUTIVE DIRECTOR

Mr. Rajat Bakshi, consultant of an American company in Delhi, has been appointed executive director of the state Trading Corporation (STC). He is expected to take charge of his new assignment next week.

Mr. Bakshi will succeed Mr. P.K. Shunglu who retired in November 1987.

With the appointment of the new director, STC will now have the full strength of five executive directors.

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RELIANCE PETROLEUM COMPLEX AT PATALGANGA:

Refinery status accorded

The petrochemical complex of Reliance Industries Limited at Patalganga in Raigad district of Maharashtra had been accorded the status of a "refinery" by the central government.

This means that the company would be entitled to a concessional rate of excise duty on the raw naphtha consumed by it in the manufacture of paraxylene.

The concessional rate of duty on raw naphtha is now about Rs. 30 per kilolitre, against the normal rate of Rs. 2,750 to Rs. 3,750 per kilolitre, depending upon the density and cut of naphtha.

The grant of concessional rate of excise levy would mean a benefit of about Rs. 150 crores per annum to Reliance Industries, it is stated.

The company's paraxylene plant at Patalganga is expected to be commissioned by the end of July 1988. The plant would consume about four lakh kilolitres of raw naphtha to be derived from refineries around Bombay for processing into about 1.25 lakh tonnes of paraxylene.

Paraxylene is a basic raw material for the manufacture of pure terephthalic acid (PTA) which is a raw material for polyester fibre and yarn.

With the refinery status, Reliance has been treated on par with the other two public sector producers of paraxylene-, IPCL and the Bongaigaon Refinery, which have been enjoying the concessional rate of excise on their raw naphtha consumption. Thus, the discrimination against Reliance has now been removed.

Reliance Industries currently uses imported paraxylene in the manufacture of PTA. The price of paraxylene in the international markets — as in the case of all petrochemicals — has shot up considerably in the past few months. The current price of paraxylene is about $680 per tonne. Together with the customs duty of 120 per cent, the landed cost works out at around Rs. 20,000 per tonne.

The cost of paraxylene based on concessional excise duty on raw naphtha will be much less than the current landed cost, it is explained. Further, the commissioning of the paraxylene plant would help in raising the overall production of yarns and fibres, it is stated.

The MEG plant of Reliance Industries is slated to commence production by the middle of 1989. On commissioning this plant, Reliance would become the most widely-integrated complex of polyester yarn and fibre in the country. It would then be one of the very few such complexes in the world, it is stated.

Meanwhile, the consumption of paraxylene in the country has increased several fold in the past few years following a spurt in the output of yarn and fibre. Bombay Dyeing, a major producer of DMT in the country, depends entirely on imported paraxylene, while IPCL and Bongaigaon depend on imports upto about 20 per cent of their requirements as their captive production is inadequate.

In a communication dated June 9, 1988, to Reliance Industries and all collectors of central excise the department of revenue of the Union ministry of finance has said that in exercise of the powers conferred by sub-rule (2) of rule 140 of the Central Excise Rules, 1944, the central government hereby declares the premises of M/s. Reliance Industries Ltd., at Patalganga, Raigad District, Maharashtra, covered by licence in form 14, as a refinery, in relation to raw naphtha falling under Chapter 27 of the Schedule to the Central Excise Tariff Act, 1985 (5 of 1986).

ONGC COMPLETES FIRST OFFSHORE 'SUBSEA WELL'

The Oil and Natural Gas Commission has reportedly achieved two high technology breakthroughs.

It claims that it has completed its first "subsea well" in Bombay offshore, with a tested potential of 2700 barrels of oil a day. Three more subsea wells have been completed at the same location but are yet untested.

Support services such as under-water inspection and electric cable laying are done by the ONGC's own vessel, "Samudra Suraksha".

ONGC also claims to have developped a new technoque to revive oil wells blocked by the flow of water. This should yield 6500 barrels a day and save Rs. 52.4 crores annually. In this activity, foaming agents are pumped ontc the well tubing.

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ENERGY CONSERVATION :

2 IDBI schemes for industrial units

Industrial Development Bank of India (IDBI) on June 9, launched two schemes of assistance to encourage energy conservation by industrial units.

These are, Energy Audit Subsidy (EAS) Scheme and Equipment Finance for Energy Conservation (EFEC) Scheme.

Under EAS, IDBI will subsidise the cost of preparation of preliminary and detailed energy audits by approved consultants including National Productivity Council (NPC), Petroleum Conservation and Research Association (PCRA) and the Technical Consultancy Organisations (TCOs), promoted by all-India financial institutions to the extent of 50 per cent of the cost. The subsidy will be up to Rs. 10,000 for preliminary audits and Rs. 1 lakh for detailed audit.

Assistance under the EFEC Scheme would be by way of term-loans for acquisition of equipment. A special feature of this scheme is that interest on the loans granted for installation of energy conservation equipment would enjoy a rebate linked to the extent of energy saving actually achieved in relation to a standard of datum level for the industry, subject to a floor level of interest at 10 per cent per annum. The base rate of interest is currently 14 per cent per annum. At the option of the borrower, interest can be funded for a period up to two years on simple interest basis.

Assistance under this scheme will be exempted from commitment charges and convertibility option. A minimum promoters contribution of 10 per cent of the cost of the project would be applicable for the EFEC Scheme.

The charges borne by the industrial concern for energy audit on its own would be treated as part of the promoters contribution for assistance under the Scheme in case the undertaking or the company takes up implementation of the recommendations of energy audit.

The term-loan under EFEC will be repayable five years with a moratorium of two years and would be secured by mortage of fixed assets acquired under this scheme.

JAIPUR PLANT MAY ENDANGER ECOLOGY

The Rs. 700-crore Aravalli fertiliser plant, proposed to be set up near Sawaimadhopur, will contaminate the water of the Banas river, affecting the villages and townships which depend on the river for their drinking water supply.

A high-level Central committee of environmental experts, headed by Mr. Anil Aggarwal, adviser to the Prime Minister on environment, had recently come to assess the environmental impart of the proposed plant.

According to the experts, the toxic effluents released from the plant would not only contaminate the Banas river but may also pose environmental hazards to the Ranthambhor wildlife sanctuary. The plant is to be fed by the HBJ gas pipeline. The famous tiger reserve is situated barely 30 km from Chauth ka Barwada, the site of the plant.

The forests and environment secretary, Mr. Mahendra Singh, accompanied the team, said the committee wanted to ensure that no damage was caused to wildlife at the sanctuary.

Though Mr. Singh refused to make any definite comment on the hazards the effluents would pose, he admitted that in the case of any accident or leakage at the plant, the sanctuary would definitely be gravely affected.

The maximum hazards will be in the shape of water pollution, since lethal effluents like arsenic will be released from the plant.

What has added to the apprehensions of experts is that a sister concern of Aravalli Fertilistrs in Goa has caused autold damage to the beach waters of that area.

It is for this reason that the environmental experts of the state are opposed to the stting up of the plant. Though this prestigious project has been given preliminary clearance by the state's pollution control board, the final verdict by the Central team is yet to be given.

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COMPANY NOTES

SERENE DYESTUFF ENTERING MARKET

Serene Dyestuff Industries Ltd., promoted by the J. N. Kanth group, is entering the capital market on July 4, with a public issue of 13 lakh equity shares of Rs. 10 each at par aggregating Rs. 1.30 crores.

The group is an established name in the dyestuff and chemical industry as a manufacturer/ supplier of a wide range of dyes, chemical textile auxiliaries, pharmaceutical intermediates etc.

The company has set up a project to manufacture anthraquinone disperse dyes and azo disperse dyes with an installed capacity of 500 tonnes per annum. The total cost of the project is estimated at Rs. 785 lakhs and will be met by equity capital of Rs. 280 lakhs, term loans of Rs. 490 lakhs and Central investment subsidy of Rs. 15 lakhs. Only about 46 per cent of the equity is being offered to the public.

Announcing the public issue at a news conference in Bombay recently, Dr. B. V. Bhoota, Chairman of the company, said that the company would also manufacture most of the intermediates for anthraquinone disperse dyes captively which would lead to better quality and lower manufacturing cost. A part of the intermediate would be sold in the market.

Further, the company would manufacture 1,000 tonnes per annum of non-ionic surface active agents which were primarily used as emulsifiers in the pesticide, cosmetics, detergent, paint and petroleum industries. Serene Dyestuff is one of the few plants in the country having such a range of manufacturing facilities.

The project is located in a centrally backward area at MIDC, in Lote Parshuram near Chiplun in Ratnagiri dist. of Maharashtra. The trial runs had already commenced and commercial production is expected to commence shortly. Hence there is no gestation period.

He further said that in the last two years, the country has made a major thrust in the export of dyes and chemicals even to advanced countries such as the US, Japan etc. and the company plans to enter the export market as well. Exports of dyestuff and related chemicals during 1987-88 was estimated at Rs. 180 crores against the target of Rs. 120 crores.

The cash break-even point of the project was estimated at 46 per cent and during the first year of operations at 65 per cent capacity, the company expects a turnover of Rs. 11 crores and gross profit before interest and depreciation of Rs. 196 lakhs.

In the second year, at 75 per cent capacity the turnover would be Rs. 13.45 crores and estimated gross profit Rs. 260 lakhs and in the third year, Rs. 15.28 crores at 85 per cent capacity and gross profit of Rs. 319 lakhs.

Barring unforseen circumstances, the company might declare a maiden dividend in the second year of operations, he added.

CAREWS PHARMACEUTICALS

Carews Pharmaceuticals, Calcutta, an associate company of the United Breweries group, has fared well during 1987-88. The company has recorded a 47 per cent growth in its sales performance and plans to introduce some new products soon.

The company will manufacture and market medicine for certain types of baldness. It has already been cleared by the Drug Controller of India for the Indian market. The medicine as a topical 2 per cent solution is available in bottles of 60 ml. for applications to the scalp. Other new products are anti-rheumatic, anti-ulcer, anti-fungal and cardiac field are slated for introduction shortly.

STANDARD ORGANICS

Standard Organics Ltd. has received approval from Food and Drugs Administration (FDA) of the US for export of its bulk drugs. A few months ago FDA representatives had visited the plant at Hyderabad.

The company is engaged in export of bulk drugs such as sulphamethazole. Exports are expected to jump to 250 tonnes during 1987-88 as compared to 172 tonnes during the previous year.

With the increase in turnover, gross income of the company also moved up during the half year ended December 31, 1987. Profit after tax also moved up to Rs. 57 lakhs in the same period compared to Rs. 28 lakhs during the corresponding period of the previous year.

The company is poised for an all-round growth with major thrust in domestic as well export markets, according to a press release from the company.

Diamines plans Rs. 66 cr. projects

Diamines and Chemicals Ltd., a company based in the petrochemical complex in Baroda and manufacturing at present ethylamine and polyamines, based on indigenous technology, has drawn up a five-year growth plan involving an expenditure of Rs. 66.5 crores beginning June 1988.

The company has commissioned its expansion of existing ethyleneamines facility from 1,500 tonnes per annum (tpa) together with new plant for piperazine (bulk drug) of 150 tpa. The investment of Rs. 4 crores has been partly funded by IDBI. The company's turnover is expected to increase by Rs. 6 crores on full utilisation of the expanded capacity. These facilities will contribute to the company's income in the next financial year beginning July 1, 1988.

The company is to set up a design and engineering consultancy service for chemicals and allied industries. The project is under formulation and will involve an outlay of Rs. 50 lakhs and would be ready for business in 1988-89. This will be a subsidiary company with 50 per cent capital participation by Diamines with the balance being brought in by participating engineers and technologists.

Two projects have been proposed in the joint sector by the company comprising a Rs. 30 crore plant for the manufacture of rifampicin, a bulk drug. The feasibility study is in progress and foreign know-how is expected to be tapped. The turnover estimate from this project is put at Rs. 30 crores.

The other joint venture is a Rs. 15 crore plant for manufacturing epoxy resins, hardeners and adhesives formulations for civil engineering applications. The feasibility study is on and this too would be based on imported technology. The expected turnover here would be also Rs. 30 crores. The two joint venture projects are expected to be commissioned during 1992-93.

In Diamines itself investments of Rs. 17 crores are to take place between now and 1990-91. There would be a substantial expansion of ethyleneamines plant to 4000/5000 tpa together with piperazine plant to 300 tpa. Involving an expenditure of Rs. 12 crores the expansion will be based on the company's own technology. The company's turnover is expected to increase by Rs. 20 crores on full capacity utilisation.

Another Rs. 3 crores would be invested to obtain piperazine derivatives like N methyl piperazine and aminomethyl piperazine. Indigenous process development is in progress and also a dialogue is on for technology import. The company hopes to derive an income of Rs. 7 crores from this project.

The company is also partly developing indigenous process while seeking foreign know-how for the production of corrosion inhibitors and related oil-field chemicals, imidazolines and asphalt additives. The capital outlay here is Rs. 2 crores and provide a turnover of Rs. 6 crores on full utilisation.

In the next five years the company will be participating in projects worth Rs. 66.5 crores and will have a sales turnover of Rs. 50 crores in Diamines and Rs. 60 crores turnover in new companies.

Incidentally, the company hopes to end its financial year on June 30, 1988 with a net sales of Rs. 12 crores (Rs. 10.59 crores) with its gross profit improving over the previous year's Rs. 178 lakhs. At the half yearly stage, ending December 1987, the net sales was put at Rs. 5.71 crores (Rs. 4.99 crores) while the gross profit was Rs. 90.68 lakhs (Rs. 80.87 lakhs).

UNITED PHOSPHORUS

United Phosphorus has earned a substantially lower pre-tax profit of Rs. 19.20 lakhs for 1987 against Rs. 197.45 lakhs in the previous year, although the sales have been higher at Rs. 23.86 crores against Rs. 23.53 crores.

The decline in profit is attributed to severe drought in most parts of the country resulting in a lower demand for pesticides, increase in power tariff in Gujarat coupled with power cut, high interest payments on account of higher inventory and a higher wage bill due to an accord with workers. The results for the current year are expected to be better provided the rains are good.

During the year, the company received engineering designs from Stauffers Chemical Co., U.S.A. for setting up a plant for the manufacture of 1,000 tonnes per annum of tri-methyl phosphite. This project is expected to be completed in the current year. During the year exports of the company increased to Rs. 348.88 lakhs from Rs. 213.87 lakhs in the previous year and are expected to improve further in the current year in view of an improvement in the international market for pesticides.

Thirumalai Chemicals faring well

Thirumalai Chemicals has reported improved working results for the first five months of the current year (January to May, 1988). The production of phthalic anhydride has been higher at 8,600 tonnes against 5,963 tonnes in the corresponding period last year, and the output of maleic anhydride has also increased from 31 tonnes to 243 tonnes.

During the period January to May, 1988, despatches of phthalic anhydride totalled 8,474 tonnes against 5,820 tonnes in the corresponding period last year, while despatches of maleic anhydride were also up from 31 tonnes to 266 tonnes.

According to Mr. N. S. Iyengar, chairman, during the current year the demand for phthalic anhydride from the plasticiser industry has been low due to various reasons and the paint industry is also not faring well, it is said. To keep the plant working at full capacity the company decided to export the surplus and earn valuable foreign exchange for the country. The company has export orders supported by letters of credit for a shipment of 3,100 tonnes during June-July, 1988. Due to the international price increase in all petrochemical products, the company has suffered pressure on its profit margins, Mr. Iyengar said.

Meanwhile, the company has applied to the government under the technology development fund scheme, for the approval of technical collaboration and import of certain equipment for the revamping of Unit-1, which will increase productivity and reduce the cost of inputs, particularly energy. With the completion of the modernisation of the phthalic anhydride plants, it is expected that the plant will stabilise and there will be a further increase in the output of maleic anhydride. The implementation of the project for the manufacture of maleic anhydride from benzene, at a capacity of 10,000 tonnes per annum is being vigorously pursued and the company's application for the import of capital goods is under process by the government.

POLYOLEFINS INDUSTRIES OUTLOOK GOOD

Polyclefins Industries ranking 137 among the E.T. listing of 251 giant companies, has achieved satisfactory working results for the year ended December 1987; it has also fared well in the current year so far. During the first quarter of the current year, the sales of the company have been higher at Rs. 39.5 crores than Rs. 34.0 crores in the corresponding period of the previous year.

According to the company's chairman, the increased demand for HDPE arising out of higher prices prevailing in the international market over the domestic prices will push up the company's sales in the current year. During the first three months of the current year itself, the sales of high density polyethylene have gone up to 9,000 tonnes from 8,000 tonnes during the same period of the last year. Production in the first quarter of the current year increased by 2.9 per cent to 11,203 tonnes over the corresponding period of the previous year.

In line with the rise in sales by 10.7 per cent to Rs. 123.4 crores, the profits before tax increased from Rs. 12.9 crores to Rs. 17.1 crores in 1987. The company paid a dividend of Rs. 28 per share inclusive of Silver Jubilee dividend of Rs. 5 per share for 1987.

All the major profitability indicators went up during the year under review. The gross return on total capital employed and on net sales increased from 19.3 per cent and 14.4 per cent in 1986 to 22.5 per cent and 16.6 per cent, respectively, in 1987. The net return on net worth also increased to 23.3 per cent from 19.0 per cent in the previous year. Dividend as a percentage of net worth was higher at 8.2 in 1987 as against 7.9 in 1986.

The company has proposed to issue bonus shares in the ratio of 1:2. These shares shall rank for dividend from January 1, 1988.

The plant to produce the prevulcanising inhibitor was commissioned during the last quarter of 1987 and the successful commercial production has commenced, the project work of Ethylene Vinyl Acetate Copolymers is progressing satisfactorily. The company has received all necessary approvals for the project. The plant is likely to be commissioned by first quarter of 1989. The company has received a letter-of-intent to manufacture chlorinated Polyethylene. Its application for Polyacetal/EPM-EPDM/Modernisation of HDPE plant, is still under the consideration of the government.

The company continues to be active in research in various organic chemicals, petrochemicals and rubber chemicals. During the last five years, the company spent more than Rs. 4.0 crores on research and development (R&D). In 1987 alone, the company had spent as a sum of Rs. 83 lakhs towards R&D.

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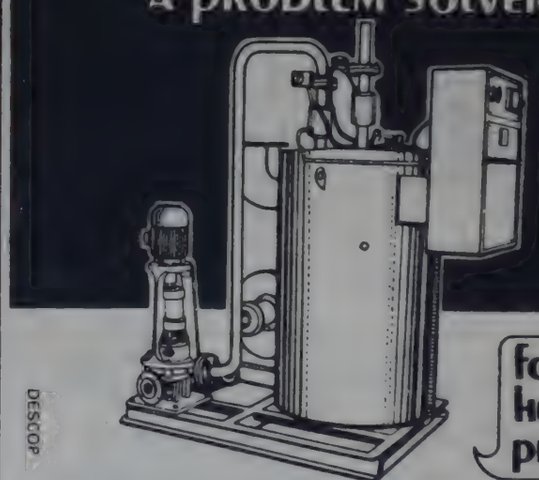

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POTLIGHT ON

Biotechnology & Life Sciences (Part 2)

IARINE BIOTECHNOLOGY ESEARCH GETS THE OVERNMENT COMMITMENT IN APAN

The Japanese Government udget for fiscal 1988 reveals a ational commitment for marine bio- chnology research. Being a esource poor island nation, it looks the sea as the major source for e creation of national wealth in iture. This is the first ever national ommitment by the Government of country for research on marine bio- chnology for developing produc- on methods (based on utilization of arine organisms) for high value emical products.

In Japan, for the purpose of tech- ological research and development arine Biotechnology Research ociety has been set up by esearchers from the universities nd private sector to open up better rospects by cooperation of several sciplines for the advancement of arine biotech research.

The sea world is largely unex- ored both scientifically and in terms its industrial potential. In its depth es hidden an abundance of yet ntapped possibilities. Research ndeavours in this direction may well eld immeasurable benefits for the uman society.

To engage in marine biotech esearch in breadth as well as depth, ubstantial material resource mobil- ation is essential for developing ew microorganisms and equip- ents for studying them at the cean depths. The Government is aking efforts to motivate several private industries to have commitment for R & D in marine biotechnology. (*Japan Chem. Wk.*, 1/21/88, p. 1).

THE FIFTH INTERNATIONAL SYMPOSIUM ON MICROBIAL ECOLOGY PLANNED FOR KYOTO IN 1989

The 5th International Symposium on Microbial Ecology will be held in Kyoto (Japan) for 6 days from August 27th, 1989 under the sponsorship of International Committee on Microbial Ecology (ICOME), International Union of Microbiology Societies (IUMS) and International Union of Biology Societies (IUBS).

This symposium will exert deep influence in future upon promotion of practical uses of microbial pesticides and microorganisms employed for fisheries. It will also help work out guidelines for field tests for microbial pesticides.

It is expected that more than 1200 people from 74 countries will participate in the symposium. The first symposium in this field was held for the first time in New Zealand in 1977. The symposium is held every three years.

The following themes will be discussed in the 5th symposium:

a) Microorganism in the paddy field ecosystem;
b) Nitrogen fixation/recycling in the biosphere;
c) The ecology of pathogenic microbes affecting fish, fish culturing;
d) Microbial control of fermented food;
e) The relationship between soil fertility and microbes;
f) The study of microbes living in the intestines and rumen;
g) The contribution of biotechnology to microbial ecology;
h) The role of plasmid in the ecosystem;
i) Microbes genetic response to agrochemicals;
j) The microbial ecology in the Asian monsoon area etc.

(*Japan Chem. Wk.*, 1/7/88, p. 4).

WORLD'S FIRST CLONING OF A GENE PRODUCING ACETIC ACID REPORTED

Researchers at Q.P. Corporation (Japan) in collaboration with researchers working under Prof. K. Yano, Faculty Head of Agriculture Department of Tokyo University, have succeeded in cloning of a gene having a function to produce acetic acid. The researchers employ a self-cloning method to confirm the gene having an acetic acid producing function.

Genetic research on acetic bacteria genes is very rare and the above research breakthrough is a world first. The researchers will clarify the configuration of the bases of this gene very soon. The researchers ultimate goal is to develop a bacterium that shows a high fermentation speed and high stability. (*Japan Chem. Wk.*, 1/7/88, p. 4).

RICE PLANTS SUCCESFULLY REGENERATED FROM GENETICALLY ENGINEERED RICE PROTOPLASTS

Plantech Research Institute (Japan) has succeeded for the first

time in the world in regenerating plants from genetically engineered rice protoplasts. On the basis of this breakthrough the researchers will now endeavour to transplant useful genes into rice protoplasts in a bid to develop new varieties of rice.

The researchers at the above Institute introduced HPT and CAT selective markers -- both of which were connected to a PVC vector --into rice protoplastes using the electroporation process, this new process is designed to transplant a target gene into cells after applying a direct current pulse to the cells, thereby improving the permeability of the cell membrane concerned.

They selected transformants --which were obtained through the above mentioned direct transformation method -- cultured them on regenerating media, and had them put forth on adventitious buds and develop themselves into small plants.

Genetic recombination research has progressed in the case of dicotyledons including tobacco, flowers and vegetables. Researchers have already developed new plants by introducing foreign gene into common plants. It was recently reported that gene coding for production of protein having the property of killing injurious insects has been successfully transplanted into a certain plant, thereby expressing itself.

Similar research, however, still remains at the fundamental stage with regard to the grasses including rice, wheat, and barley and monocotyledons including soybeans and corn. It is yet to be reported that a graminoid plant has been regenerated from a recombinant.

In Japan, however, Sumitomo Chemical and Mitsubishi Toatsu Chemical, as well as Plantech Research Institute have recently succeeded for the first time ever in regenerating plants from rice protoplasts. This is a proud landmark in Japanese biotech research. (*Japan Chem. Wk.*, 17/12/87, p. 1).

KLINE COMPANY'S REPORT ON 'AGRICULTURAL BIOTECHNOLOGY: ITS COMMERCIAL IMPACT TO 1995'

Biotechnology will have a significant impact on agricultural markets during the next decade with sales projected to reach over $2 billion by 1995. It will open up new opportunities in the mature agricultural industries with two-thirds of projected sales fulfilling currently unmet needs.

These are the main findings of a new survey 'Agricultural Biotechnology: Its Commercial Impact to 1995', published by the US market analyst Kline & Co.

In the Report, Kline predicts sales of products developed through biotechnology to grow at an annual rate of over 60% for the next 10 years and expects market to double and even triple beyond 1995 levels as we enter the 21st century. Kline believes biotechnology will initially contribute to the ongoing evolution of agricultural products, but could hold the long-term potential to revolutionise the animal health care, crop protection and seed-improvement industries.

Current biotechnology sales are estimated at only $14 million with products confined to animal health therapeutics, disease diagnostics and micro-propagated crop plants. By 1990 Kline predicts that many additional biotech derived agricultural products will begin to reach the market place, including animal health vaccines and genetically-engineered microbial insecticides.

By 1995 Kline expects a full range of products to be commercialized and important advances to be introduced. Amongst these could be herbicide-and pest resistant crops, hybridised varieties of important crops and bovine and porcine growth hormones.

For further information on the survey contact Karen Rose, Kline & Co., 330, Passaic Ave., Fairfield, N.J. 07006, U.S.A.

STATUS OF MONITORING IN BIOTECHNOLOGY

Traditional methods of monitoring bioprocesses rely either on removing samples with subsequent analytical chemistries or indirect monitoring by sampling the gas phase (Comprehensive Biochemistry, Moo-Young M.ed., Pergamon Press, Oxford 1985, pp 423-431). In recent years powerful new techniques have been developed for fabricating probes that have a high degree of biochemical specificity and provide the capability to monitor directly key substances that influence and control cell behaviour (Bioseniors Fundamentals & Applications, Oxford Univ. Press Oxford, 1986).

Nearly all of today's biosensors are composed of a biologically active material (e.g. enzyme, antibodies, binding protein) in intimate contact with a suitable optical or electronic system to convert the biochemical event into a quantifiable electrical signal that can be processed and transmitted (*Trends in Biotechnology*, 1984, 2, 59). The transducer element usually contains the chemistry that provides the selectivity of the device. The detector element is usually physical in nature, optical, thermal, or frequency sensitive, primarily determines the sensitivity of the device, and selective membranes control the immediate environment of these subsystems.

A wide variety of biochemical systems, e.g. enzymes, antibodies, binding proteins, and bioreceptors can be utilized with a number of detector elements to provide many opportunities for selective, sensitive and miniature probes. With advances in micro-fabrication of electronic as well as optic devices, on the one hand, and the capability (by genetic engineering) to produce and modify proteins to serve as analytical reagents, on the other, one can expect a new generation of biosensors that will provide the capability of monitoring and controlling bioprocesses both at the laboratory research level and at the commercial production level. (*Enzyme Microb. Technol.*, 11/1987, pp 697-699).

A NEW BIOTECH TECHNOLOGY IN COMMERCIAL CULTURING OF MICROALGAE AND MACROPHYTIC ALGAE (SEAWEED) MAKES A DEBUT IN USA

Ocean Genetics Inc. (Santa Cruz, California) has combined classifical breeding with proprietary technology to commercially culture microalgae (seaweed) for the production of a range of products like agarose etc. Until now, agarose, a non-toxic polysaccharide, has been derived from certain red seaweeds that grow wild in oceans around the world. The company is developing seaweed strains for production of agarose, as well as for pharmaceutical, agrochemical, product screening and other applications.

Ocean Genetics has begun a $2.5 million expansion of its algae mass culture facilities. The company is gearing up for the mass production of agarose in a big way, for marketing the same later this year. The biotechnology industry and research laboratories use agarose extensively, both as biological culture media and in the separation and purification of complex molecules such as proteins and DNA. Worldwide sales of agarose are estimated to be increasing by 25% per year, due to the projected growth of the biotech industry. Ocean Genetics will use the expanded facility to supply agarose of "consistent quality" and will not be dependent on natural populations of seaweed. (*CMR*, 3/21/88, p. 9).

GENETIC ENGINEERING OF CROPS MAKES A DEBUT IN USA

Calgene Inc., a California based producer and marketer of industrial rapeseed is aiming for a major R & D programme for developing new high value oils through genetic engineering of rapeseed. High Erucic Acid Rapeseed (HEAR) or industrial grade rapeseed was successfully introduced in 1987 in USA by Calgene with a small crop of between 10,000 and 15,000 acres in the Delta Region (Tennessee, Missouri, Mississipi and Arkansas). Calgene is currently marketing this product on a contract basis.

The company is in business to produce oils for specific end-values whether for the food industry or inedible purposes. Calgene researchers are endeavouring to engineer permanent qualities into the seed's genetic make-up, and on so doing turns the commodity into a speciality product. Calgene's R&D is also involved in projects dealing with tomatoes, cotton and corn. Calgene researchers are aiming towards turning the rapeseed into a small chemical factory. Rapeseed is a high-oil-by weight product, which is on the top end of commercial oilseed crops. (*CMR*, 3/21/88, p. 11).

A LOW-CALORIE BEER FROM r-DNA MANIPULATION OF BREWER'S YEAST

Researchers of Biotechnica International are testing a recombinant yeast that could make 'light' beer without costly chemical additives or time consuming changes in barley preparation.

Beer begins with barley, and the primary constituent of barley is high calorie starch. Malting processes convert all but 25% of that starch into sugar, and then yeast ferments the sugar into alcohol. About a third of the calories in ordinary beer come from the excess, unconverted starch. To make light beer, brewers get rid of surplus starch by either extending the malting period or adding starch degrading enzymes. As a result another 15% of starch becomes alcohol; the light brew is then diluted to match the potency of regular beer.

Researchers at Bio-Technica International Inc., tool from a common industrial bacterium a gene that codes for a starch degrading enzyme and spliced it into the DNA of brewer's yeast. The engineered yeast can turn excess starch into sugar on its own, eliminating the need for enzyme additive or lengthy malting. The effect is akin to breeding cows that give skim milk; the resulting brew, however, must still be diluted. Biotechnica reports its yeast achieves the same conversion efficiency as enzyme additives. Last February at the Brewery Research Foundation in Surrey, England, brewery experts got a glimpse of Bio Technica's high tech beer. The yeast's success will probably depend on how well its beer pleases the palate.

Still it may be several years before the products of genetic engineering come by the case. Recombinant food products face an uncertain regulatory climate in the USA, where most precedents are being set by medical research. (*Sc. Amer.* 2/1987, p. 89).

A RESEARCH AGREEMENT FINALIZED TO PRODUCE CHIMERIC MONOCLONAL ANTIBODIES (CMAB)

Joint development of chimeric monoclonal antibodies (CMAB) to diagnose and treat cancer is the aim of the recent collaborative research agreement between Eastman Pharmaceuticals (Phila, PA) a division of Eastman Kodak and International Genetic Engineering (Ingene) in Santa Monica, Callif., USA. Chimeric monoclonals are part human and part mouse. In contrast, conventional monoclonals are all mouse.

The advantage of CMABs over conventional monoclonals, is that CMABs should cause reduced immune reactions since they are part human. Eastman -- which will have exclusive worldwide rights to resulting products -- will provide Ingene with a mouse hybridome cell live producing mouse monoclonals.

Ingene will then use proprietary technology to develop cell lines that produce chimeric monoclonals specific to certain cancer cells. Ingene will receive payments for developing specific chimeric monoclonals and royalties on sales of resulting products, and will retain certain manufacturing rights. (*Chem. Wk.*, 3/9/88, p. 12).

LIPOLASE -- THE WORLD'S FIRST GENETICALLY ENGINEERED ENZYME

Several firsts mark the commercialization last march of the enzyme Lipolase by Denmark's Novo Industry A/s (Bagsvaerd). It is the first enzyme to be industrially produced by genetic engineering, the first lipase to be commercially manufactured since these group of enzymes were discovered in 1913 and the only enzymes available to detergent producers for dissolving lipid stains (e.g. fatty stains caused by cosmetics, gravy, edible oils and body grease) -- current enzyme products called proteases, remove only protein and starch stains from clothing.

Initially, Novo will produce Lipolase at Novo Biochemical Industry, a subsidiary in Hokkaido, Japan. (*Chem. Eng.*, 3/14/88, p. 17).

NATIONAL BIOTECHNOLOGY POLICY CENTRE MAKES A DEBUT IN USA

The National Wildlife Federation last December announced establishment of a National Biotechnology Policy Centre. Citing potential threats to the environment from rapid advances in bioengineering, the NWF's centre will oversee federal agency review of applications to release new organisms into the environment, review existing laws to determine whether new legislation is needed to regulate biotechnology and carry on public education programmes.

Headed by Margaret Meilon, an NWF attorney with a PhD degree in biology, the centre is supported by a $210,000 grant from the Joyce Foundation. NWF is the USA's largest conservation organization, with more than 4.8 million members and supporters and 51 affiliate organizations. (*C & EN*, 12/21/87, p. 12).

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* Australian pharmaceutical concern F.H. Faulding is expanding into Japan with its new anti-asthmatic drug *Duraphyl*.

The company has signed an agreement with Teikoku Seiyakuy which will distribute the product. By 1995 sales of the treatment in Japan could be worth some $20 m.

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Cyclodextrins — A New Range of Value-added Products Developed From Starch

Cyclodextrins are new value-added products developed from starch by biotech process abroad in U.S.A., Japan & Europe. They were discovered in 1891 when Villiers reported their occurence in rotting potatoes. In 1904, Schardinger characterized them as cyclic oligosaccharides and identified *Bacillus macerans* as the bacterium that produced CG Tase, the enzyme that modified the starch molecule. In 1938, Frendenberg confirmed the ringed structure of cyclodextrins and their ability to form inclusion complexes (Saenger 1980).

In recent years after 1980, much advance has been reported in the enzymatic synthesis of cyclodextrins. It is now certain from research in U.S.A. and Japan that cyclodextrins will become commercially available at economic prices. Biotech processes for cyclodextrins are on the near horizon for commercial production of cyclodextrins from starch.

A glycosyltransferase (CG Tase) is used to act on corn starch, producing α- ß- and γ-cyclodextrins, consisting respectively of six, seven and eight glucose monomers. These monomers are bound together in a doughnut -shaped ring, giving the cyclodextrins a molecular structure which is relatively rigid and has a hollow cavity of a specific volume. Polar hydroxyl groups are oriented to the outside of the rims. Consequently, the outer surfaces have a hydrophilic nature. The internal cavity has a relatively high electron density and hydrophobic nature due to the hydrogens and glycosidic oxygen oriented to the cavity interior.

Due to the hydrophobic nature of the cavity, molecules of initable size, shape and hydrophobity are able to interact noncovalently complexes. For instance, a ß-cyclodextrin is able to form inclusion complexes with flavour substances of typical molecular mass between 80 and 250. Linder reported in 1982 that the molecules of nearly all natural spices and flavours fit into this range.

Properties of Cyclodextrins are summarized in Table below:

Greater availability of cyclodextrins at an economic price will open up many new applications in the food and pharmaceutical sectors.

Applications:

Several potential applications of cyclodextrins are on the horizon:

** Controlling Flavour Release*

The greatest potential for cyclodextrins is in the field of flavours and spices. Cyclodextrins, can stabilize volatile materials — instead of releasing flavours prematurely as often happens in processing, they can control the flavour release so that the warm moisture of the mouth triggers their release for full impact. Nagatomi, Japan reported in 1985 that cyclodextrins preserved the flavour of cookies, biscuits, citrus fruits, Japanese onions, garlic, celery, vegetable pastes and a variety of other products. The strong smell of onion oil, garlic oil, and pyrazines restricted their use, but that complexing with cyclodextrins prevented their flavour from being lessened in processing and released their flavour directly into the mouth.

** Masking Odours And Tastes*

Cyclodextrins can lessen the odours of such products as fish, mutton, garlic, soybean milk, lecithin and old grains. They can also mask the bitter or off tastes of

TABLE - I

Type of Cyclodextrins	Glucose Units	PROPERTIES					
		Mol. Weight	Molecular Size (A°)			Water solubility g/100 ml at 25°C	$(\alpha)^{20}$ (H_2O 1%)
			Inside Diam.	Outside Diam.	Height		
α	6	0973~	5.7~	13.7~	7.0	14.50	150.5
ß	7	1135~	7.8~	15.3~	7.0	01.85	162.5
γ	8	1297~	9.5~	16.9~	7.0	23.20	117.4

orange and grape fruit juices, protein hydrolysates, meat pastes, mushroom extracts and a variety of other products for an improvement of smell and taste. The masking of undesirable odours and tastes is most effective at low temperatures and higher cyclodextrin concentrations.

** Stabilizing Emulsions*

Cyclodextrins can stabilize emulsions of fats and oils (shielding the fats and oils from oxidation and thus preventing rancidity). They can be used in products as salad dressings, eggless mayonnaise, seasoning oils and fats, whipping cream and in any oil-in-water application. e.g. 1-3% ß-cyclodextrin can stabilize emulsions, in mayonnaise made from edible oil.

** Increasing Foaming Power*

While whipping 1 gm egg white gives 7.36 m foam, the adding of 0.75% -cyclodextrin increases the volume of foam to 10.72 ml. Further the foam formed with cyclodextrin as additive is far more stable on storage at -15 Degree C.

** Controlling Or Masking Colour*

Natural pigments such as carotenoids and flavonoids, can be stabilized with a cyclodextrin complex. Pigment can be masked or colour tones intensified.

** Other Uses*

Cyclodextrin complexes can protect ingredient from oxidation, light-induced reactions, thermal decomposition and evaporation loss. Crystalline complexes are stable, improving processing conditions, handling and storage. Because of their abilities the potential for new applications are vast.

Cyclodextrin complexes can be used to prevent formation of precipitate in soft drinks, canned citrus poducts etc. In processed meat products, they improve water retention, and texture and can be used in making of sausage casings. Tea quality can be improved by adding aroma complexes to tea leaves or the contents of tea bags. The flavour of dehydrated soups can also be improved by incorporating cyclodextrin as an additive.

Modified Cyclodextrins

In recent years researchers have produced several modified cyclodextrins by substituting various organic groups in place of the polar hydroxyl on the outside of the rim of cyclodextrin molecule. In this way, several modified cyclodextrins can be obtained with different properties.

For instance, while a ß-cyclodextrin forms stable crystalline structures, it is also low in solubility. In some applications, this may be desirable, but in other applications, including flavours, a more soluble ß-cyclodextrins may be called for; consequently its solubility has to be improved. This can be accomplished by substituting various organic groups on the hydroxyle of the rims of the cyclodextrin molecule.

The development of cyclodextrin polymers is another direction which can greatly expand the field of applications for cyclodextrins. Recent researches have shown that cyclodextrins can be incorporated into polymer structures. One such polymer is obtained by linking cyclodextrin rings with suitable agents such as epichlorohydrin to produce an insoluble copolymer resin in the form of water-swelling beads. This resin can be used for selective separations. One major application is the debittering of grapefruit juice. The polymer is reported to remove such bitter components as naringen and limonin from grapefruit juice.

In this new process (under development at U.S. Dept. of Agriculture's laboratories in Winter Haven, Florida an immobilized, chemically modified ß-cyclodextrin polymer (developed by Amaizo, U.S.A.) is currently employed to debitter grapefruit juice. In this process cyclodextrin monomers are cross-linked with epichlorohydrin and the grapefruit juice is processed in a 7.6 cm, continuous flow column with a bed volume of 800 ml. The process reduced naringen level by 45% through 16 bed volumes before regeneration was required to remove trapped molecules. The cyclodextrin polymer retained its ability to trap bitter component through 21 regenerations. Taste panels showed a 95% preference for the debittered juice over the control juice.

Because of these positive encouraging results cyclodextrins can be used in future in the debittering of citrus products. Furthermore, a similar approach could extend to other applications including debittering hops. In Japan, cyclodextrins are being used to complex both the clouding and bitterness components of orange juice.

Commercial production of cyclodextrins in a big way is on the horizon in U.S.A. American Maize Products Company has petitioned Food & Drug Administration (FDA) in U.S.A. for clearance to use cyclodextrins in food applications. The Company's production facility for cyclodextrins is nearing completion at Hammond,

ndrane. This plant is capable of producing several million pounds of cyclodextrins per annum. As a result of over five years successful R & D, the company is reported to be successful in producing cyclodextrins at an economical price for exploiting the several potential applications for these versatile products. Japanese companies are also producing cyclodextrins by biotech processes. The search for new more efficient enzymes for production of cyclodextrins continues at a feverish pace in Japan, U.S.A and Europe. Cyclodextrins have been used in food applications in Hungary, and Japan. Beginning late 1970s Hungary has been marketing commercial quantities of cyclodextrin — essential oil complexes in Eastern European Countries.

Future Prospects:

It took cyclodextrins nearly a century after their discovery to find applications in industry. This is a slow but steady evolution from their perception of being merely scientific curiosities and moving toward the realization of being unique materials that can provide a variety of practical uses in the food and pharmaceutical industry. Each new fact learned about their properties, each new technological advance in their production process, provides a new foundation, which is built upon a previous one. Consequently, today the necessary parts are in place for the potential of cyclodextrins to be fully realized.

Furthermore, many of the properties that make cyclodextrins suitable for pharmaceutical applications or other non-food applications are often the same properties that make cyclodextrins suitable for use in the food industry. Therefore, every new application discovered can serve to benefit the food industry. The commercial production of cyclodextrins should be of great interest to starch-producing countries (such as India, U.S.A. Brazil, Indonesia, etc.) as cyclodextrins are high-value products produced from cheap raw material starch. Therefore, search for efficient enzymes for economic production of cyclodextrins will continue in advanced countries, particularly in U.S.A., Japan and Denmark. Biotech research will play a major role in the future development of new enzymatic process for commercial production of cyclodextrins at the lowest possible price.

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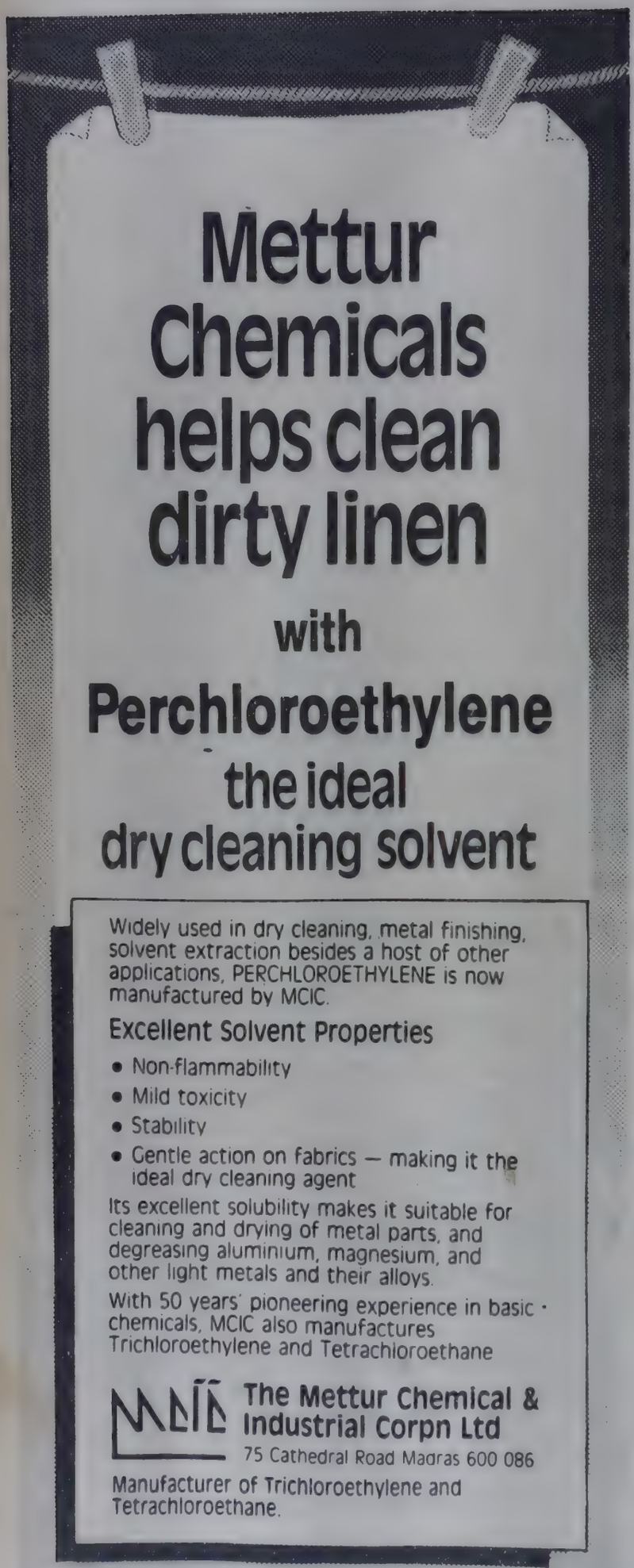

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Making Better Use of Enzymes

JOHN NEWEL
Science and Industry Editor, BBC External Services

Because enzymes are so efficient and specific as catalysts for chemical reactions, they have many industrial applications. Ways are now being explored to overcome certain limitations in their use and achieve even greater economic advantages.

Enzymes, nature's catalysts, are already used industrially on a large scale. Brewing beer, making bread and putting power into washing powders are the best known examples. Industrial chemists would like to make more use of enzymes because of the advantages they have over man-made catalysts. Enzymes are more specific in the reactions they catalyse, so they do not produce unwanted byproducts. They are generally more efficient in promoting reactions and they cut energy requirements because they can catalyse reactions at low temperatures and pressures, instead of the high temperatures and pressures needed by conventional industrial catalysts. There is a cautious but steadily growing interest in their wider use in industrial processes.

Nevertheless, there are still strict constraints on expanding the use of enzymes because of their restricted availability from natural sources. New ways are being sought to increase their numbers, in work supported at a number of UK research centres.

Techniques for widening the scope for enzymes include providing them with synthetic partners, to replace the unstable natural chemical ones called coenzymes, which cannot work satisfactorily with immobilized enzymes outside living cells. (Immobilizing enzymes means restricting their free movement, which can be done by trapping them in a supporting substance; it allows them to be used more than once or even continuously).

Altering the surrounding conditions so that the reaction catalysed by an enzyme works in the opposite direction to normal is another technique being developed. Some scientists are seeking out tough enzymes resistant to heat and stress.

Coenzymes

Most enzymes require a coenzyme if they are to work. When such enzymes are used industrially, immobilized and mounted on a solid medium, the cost of providing the unstable natural coenzyme partner in solution is often more than the cost of the enzyme itself. In a project financed co-operatively by the Biotechnology Directorate of the UK Science and Engineering Research Council (SERC) and Imperial Chemical Industries, the Cambridge Biotechnology Centre, directed by Dr. Chris Lowe, has developed stable, tough synthetic coenzymes.

The synthetic coenzymes are adapted textile dye molecules. They were first developed, and their interactions with protein molecules studied, to produce new dyestuffs. Dr. Lowe and his colleagues found that certain reactions between dye molecules and proteins showed promise for development into similar reactions between coenzymes, enzymes and their substrates. Dr. Lowe identified the specific chemical groupings that enabled the dye molecules to act as coenzymes, and coupled them to the dye molecules, (for example nicotinamide for nucleotide dependent enzymes) and thereby converted the molecules to coenzymes which, which further research has shown, are stable enough to be immobilized along with their partner enzymes. A patent for the system has been accepted.

Dr. Lowe believes that this work will substantially extend the use of enzymes in industry. The modified dye molecules can be synthesised very cheaply and in any amounts. Working in conjunction with appropriate enzymes, they will allow biotechnologists to extend greatly the enzymic synthesis of fine chemicals and pharmaceuticals.

Organic Solvents

Another project that has great potential for extending the scope of enzymes is being undertaken by Dr. Peter Halling in the Department of Biosciences at Strathclyde University, Glasgow. In work partly financed by the Biotechnology Directorate of SERC, Dr. Halling has been investigating how far it may be possible for enzymes which normally work in aquaeous environments to do without water and work instead in organic solvents preferred by industry.

Dr. Halling has shown that many such enzymes can work in solvents if they retain a small amount of water in their immediate environment, so small that Halling calls them 'damp' enzymes. In these changed conditiions, enzymes that normally depend upon abundant water for the reaction they catalyse, hydrolysis, reverse the directions of the reaction. Instead of hydrolysing and breaking down complex compounds they synthesize them, using raw materials that would normally be breakdown products of the reactions they catalyse.

Working co-operatively with ICI, Dr. Halling has shown that proteases, enzymes that normally break down proteins and their constituent peptides, can be used instead to build up peptides, from raw materials that are available cheaply. His work has now reached the point where he and his colleagues are convinced that the technique has great industrial potential. Among the possible products of proteases made to work backwards in this way are artificial sweeteners and synthetic versions of the peptides which, it has been found in recent years, serve as natural control chemicals within the body and so have potential pharmaceutical uses.

Through work with Unilever, Dr. Halling has shown that lipases, enzymes which normally break down fats and oils, can be made to synthesize them instead, by radically altering the environment of the enzymes. Cheap substitutes for cocoa butter may be made in this way. Halling and his team believe the idea has important applications to the chemical industry. Besides being able to make their products from cheap, readily-available raw materials, enzymes working backwards have the advantage, as do other enzymes, of making their products with great precision and specificity and without creating a host of unwanted chemical by-products.

Tropical Forests

Chemical industries need enzymes that can work under stress, which may be physical or imposed by heat or chemical contamination. Professor Joh Higgins, Director of Cranfield Biotechnology Centre, Bedfordshire, believes that the world is making far too little effort to seek such enzymes in nature. Most scientists who are engaged in such research look for potential industrial enzymes in thermophilic bacteria, which live in natural hot springs. But in Professor Higgin's view not many of the enzymes that are to be found there are likely to be useful because of their restricted range of organic materials that they can metabolise. He is instead searching for enzymes in tropical rain forests, because of the great variety of organic chemicals and micro-organisms they contain. For example, waste products from palm oil extraction are dumped in ponds where temperatures may reach 90°C through a combination of heat dissipated from metabolic processes and tropical weather conditions. Microorganisms and their enzymes have evolved to tolerate such conditions to break down a very wide range of metabolites.

Working with colleagues in Mexico, Thailand and elsewhere, Professor Higgins has already identified promising organisms and has arrangement with commercial organisations for their exploitation. Industrial applications should follow within two to five years.

(Courtesy: *SPECTRUM/5,* No. 210 1988)

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NEWS FROM JAPAN

Over 4,000 t/y of Light Rare Earth Oversupplied Worldwide

A total of 4,150 tons a year of light rare-earth elements are oversupplied throughout the world according to a report compiled by Japan Society of Newer Metals. The combined figure includes 700 tons for cerium, 500 tons for lanthanum, 650 tons for praseodymium and 1,350 tons for neodymium.

Demand for middle/heavy rare earth is increasing for use in magnetic material (Samarium) magnetic recording material (terbium) and superconductive material (yttrium)

Raw-material monazite and bastnaesite contain light rare-earth elements at the rate of 92 and 99%, respectively. Such middle/heavy rare-earth elements as mentioned above are contained in the balance When raw-material ore is treated in accordance with the demand trend of middle/heavy rare earth, light rare earth tends to be oversupplied.

If middle/heavy rare earth is produced at the rate of 1,579 tons, light rare-earth production reaches 19,441 tons. The latter's world production stands at 20,300 tons a year, much higher than the global demand of 16,150 tons a year.

Major applications of light rare earth are abrasives and catalysts. It is forecast that demand for use in the two sectors will level off and decline, respectively, though application to magnetics (neodymium) and capacitors is expected to reach 1,500 tons a year in the year 2000 and increase at an 8% growth rate, respectively.

Japan's yttrium and europium demand has increased 14 and 10 times, respectively, in the past 10 years. Light-earth production, however, has been reduced to 60% of the combined production capacity throughout the world, presenting a great contrast to the continued shortage of medium/heavy rare earth.

World demand for yttrium is estimated at 400 t/y ; samarium, 400 t/y gadolinium, 350 t/y europium, 20 t/y, and terbium, 20 t/y.

Mail-order Sales of Specified Pharmaceuticals Authorized

The Ministry of Health and Welfare has decided to approve mail-order sales of six groups of drugs and sanitary supplies including absorbent cotton, gauze and sticking plasters. It recently informed local governments of this decision.

The six are agents affecting respiratory organs, those for dermal and oral use, antihemorrhoidals, agents for epidermis and nutrients/tonics. They include, for example, gastrointestinal agents, gargles, vitamin preparations and nutritious drinks. They cause fewer side effects.

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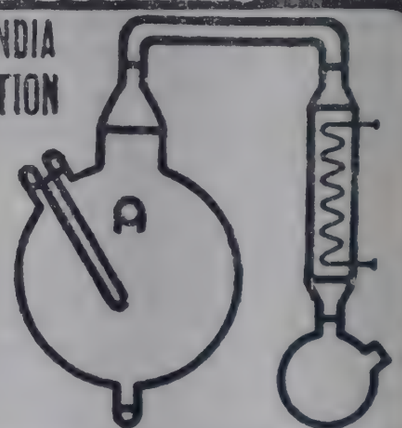

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Mail-order companies will be able to sell them with the conditions that they specify their names, addresses, efficacy of their products and prices on the catalogues involved, installs telephones and post staff members for the purpose of meeting inquiries from consumers.

When launching into the business field concerned, they are obliged to obtain a license for drug sales. It is generally believed that the ministry's decision will help expand the market for common drugs.

To date administrative advice has been given to the effect that pharmacists at pharmacies should sell general-use drugs after confirming the physical conditions of consumers through oral questioning and giving them instructions for use. There are, however no legal restrictions on the manner of marketing medical-use equipment and quasi-drugs.

Some private businesses previously began mail-order sales of drugs, thus causing a dispute about the safety of the drugs concerned.

Mitsui Petrochemical to set up two new crackers

Mitsui Petrochemical Industries, Ltd., recently announced that it is planning to have Ukishima Petrochemicals Co , set up two crackers having a cracking capacity of about 60,000 tons a year around 1989-1990 because the latter's 1st and 2nd ethylene plants now have no spare crackers and because the expected naphtha shortage problem must be solved.

The two new crackers can use heavy-NGL and butane, etc., as raw material. A present raw material other than naphtha is being used at the rate of only 7%. The company intends to increase this to 40% after completion of the two crackers.

Ukishima Petrochemicals is an equally owned subsidiary of Mitsui Petrochemical Industries and Nippon Petrochemicals.

Mitsui Petrochemical expects demand for naphtha to increase, and the price of naphtha is also expected to rise because Korea and Thailand, etc., are setting up naphtha crackers. Consequently, the company has so far been examining raw-materials diversification.

In addition, Ukishima Petrochemicals' 1st and 2nd ethylene plants, as mentioned before, have no spare crackers and they are in full operation at present. As a result, demand for setting up new spare crackers has been setting stronger from the view-point of ensuring safety.

Ukishima Petrochemicals' new crackers are expected to attract a great deal of attention from interested parties in the petrochemical industry.

Organic Pigments Production in 1987 Shows Recovery

Production of organic pigments in 1987 marked 24,893 tons, up 7.4% over the previous year. This figure reached the highest level ever. Industry sources see the increase as reflecting favourable business in main outlets such as printing inks and resin colorants. The steady position is likely to continue up to around this summer.

By product item, phthalocyanine registered 11,913 tons, up 9% over the previous year; insoluble azo, 5,190 tons up 6.8% soluble azo, 6,943 tons. up 5.5% and pigments resin color, 8,431 tons, up 0.4%.

Looking at demand, captive use was 7,240 tons, a slight increase of 4.1% over the preceding year, and shipments, 17,665 tons, up 8.1% exports scored 15,464 tons, up 9.6%.

Regarding price considerations, some raw materials and intermediates for organic pigments were on an uptrend last year. Amelioration of profitability will be the biggest theme this year.

Bayer Joint Venture in China Goes into Production

Bayer-Shanghai Dental Ltd., a joint venture between Bayer AG, Leverkusen, and the Chinese company Changhai Dental Materials Factory, which has its registered place of business in Shanghai in the People's Republic of China, began the production of artificial teeth on March 30, 1988 as scheduled. The inauguration ceremony was attended by guests from the political, economic and scientific sectors.

The first phase envisages the manufacture and sale of 15 million artificial teeth per year, 25% of which are intended for export. Other dental products will be added later.

Bayer-Shanghai Dental Ltd. was founded in August 1986 with Bayer's interest in the DM 4 million initial capital amounting to 55%. Apart from this first joint venture in the People's Republic of China, Bayer maintains offices in Beijing and Shanghai.

New Developments from Japan

New High-Temperature Resistant Resins For Composite Developed

Toray Industries, Teijin Limited, and Mitsubishi Chemical Industries are jointly engaged in developing heat-resistant composite materials for advanced aircrafts and space shut-that they have developed AMPI (modification of end-capping agent of nadimide end-capping agent of nadimide-end-capped PMR (Polyimide), SEPI (nadimide end-capped imide oligomer soluble in common, benign, volatile solvents), and NTPQ (addition curable polyphenylquinoxaline oligomer).

Physical property evaluations by these companies show that a composite material using these resins is resistant to temperatures of around 290 to 320°C (glass transition-point temperature) and has a tensile strength of 2,430 maga-Pascal (around 240 kilograms/square milimeters). The development of these resins has been included as part of one of the R&D projects for next generation technologies by the Industrial Science and Technology. The above results suggest the possibility of commercializing Polyimide-TPQ composite materials which are not yet available in Japan.

The project for next-generation technologies includes development of composite materials with excellent strength and heat resistance which are lighter than aluminium alloys and yet stronger than iron. The development of these new resins by these companies has been promoted as part of a programme assigned by the Research and Development Institute of Metals and Composites for Future Industries.

Epoxy resin composite materials have already been used in aerospace sectors. However, the use of heat-resistant resin composite materials has not yet been fully exploited. Resin manufacturers have consequently been concentrating on developing improved heat-resistant resins for use in advanced aircraft and space shuttles. For application in the aerospace field, it is necessary to develop heat-resistant matrix resins that can withstand temperatures of more than 250°C tensile strength of more than 240 kilograms/square milimeter. and also retain excellent moldability.

Cement Makers Betting on Fine-Ceramics Ventures

Japanese cement makers are moving toward stepping up their novel-material operations in a bid to expand their non-cement businesses. They have gone beyond the laboratory stage and launched into commercialization of applied products.

Mitsubishi Mining & Cement Co. has affiliated electronics parts makers and branched out into electronics-ceramics business; it has already developed electronics parts and apatite-based bio-ceramics. It recently completed a central laboratory, which will lay the foundations of the planned new business covering magnesia-based ceramics and whisker, engineering ceramics, and so on.

Onoda Cement Co. has completed a fine-ceramics plant at its Onoda factory, thereby establishing a through production system covering from raw material to finished products. Targeted products are engineering ceramics produced from alumina, zirconia, silicon nitride and silicon carbide etc.

Nihon Cement Co. established last year a subsidiary aimed at developing and manufacturing fine ceramics. The new company is scheduled to start operating its new plant in June. Nihon Cement's central laboratory is laboring to develop composite ceramics. The targeted new business, will be transferred to the subsidiary company when it has proven itself commercially viable.

Sumitomo Cement Co. has provided a full line of ultrafine particles comprising oxides and carbides. The company is now endeavouring to produce thin films from the ultrafine particles. It envisages building a production base when the new business is smoothly under way.

Chichibu Cement Co. has inaugurated fine-ceramics R & D by setting up a ceramics technology centre at its Kumagaya factory in June. 1986. It has succeeded in pioneering high-purity, ultrafine mullite powder and started marketing activities for the new product using a pilot plant. It is striving to develop mullite-based composite ceramics.

Safe, Handy Microcapsuled Termiticide Marketed

Nippon Kayaku Co. has started marketing inhouse-developed 'Kayatak MC' antitermite agent, in which the chlorpyrifos ingredient is capsuled by ultrathin (0.3 micrometer) polyurea-resin film and the resultant fine particles (diameter: 30 micrometer: Photo) are dispersed in water. The company has pioneered the microcapsuled agent with a special subsidy granted by MITI.

The new product features improved safety for the workers who apply it. When conventional emulsion products are coated on the skin of rats, their plasma cholinestrase activity declined to 10% of the normal level one day after the coating. The corresponding figure for the new agent is 90%. It is applied within soil and its concentration in air after practical application of the product itself is lower than in the case of conventional products. It emits less odor since it is microcapsuled.

It has both contact and feeding effects. It is equal to existing chlorpyrifos preparations in terms of the time needed to produce desired effects and the duration of the effects.

The company is aiming to promote sales of the new product as well as existing oil-soluble and emulsion-type products. It thereby intends to command 30% of the domestic market for anti-termite agents.

Chlordane — a staple antitermite agent used in the past — was legally designated as a "specific chemical substance" in November 1986 and has now been replaced by organic phosphorus preparations including chlorpyrifos. They have, however, a high degree of acute toxicity and there is a strong fear that they may reduce the cholinesterase activity of workers. Their microcapsulation is expected to achieve a technical breakthrough.

Prompt Checking of some shell Toxicants Made Possible: Ube

Ube Industries Ltd., has developed together with Professor, K. Yasumoto of Tohoku University, an easy method to check for diarrhea-causing toxicants contained in some edible shellfish such as scallops and Soletellina diphos.

This method using a kit employing the monoclonal antibody specially developed for this purpose enables detection of such toxicants in only 10 minutes, whereas conventional methods using mice requires a day for the examination. The toxicants are produced by plankton in the sea and accumulated in the insides of particular shells. These substances cause diarrhea when consumed and thus samples of such shells have to be subjected to toxicity tests by authorities before shipment.

The new testing kit is easy to use and will be marketed for Y30,000 per 20 kits. The company is intent on selling the kits to public and private hygiene laboratories in the Hokkaido and Tohoku districts — northern part of Japan — where scallops and other similar shellfish are being raised extensively.

Eisai Will Conduct Clinical Tests on New Drugs in U.S.

Eisai Co. will start clinical testing of its inhouse-developed drugs in the U.S., following the start of that in Europe. The first such drug is a cephen antibiotic (code: 1040) scheduled to undergo a clinical test this autumn, to be followed by a tissue plasminogen activator, an anti-Alzheimer disease agent and an anti-arteriosclerosis agent etc.

In Europe, the company has been carrying out phase III clinical tests on its "Betanol" anti-hypertensive together with Sandoz of Switzerland. The Japanese company plans to apply for manufacturing approval for the drug there during next year and to set up a joint venture for commercialization. In the US. Eisai intends to conduct clinical testing independently.

These steps reflect Eisai's long-term policy aimed at extensive deployment of drug operations overseas.

Under the 1st phase medium-term plan that started in 1987, the company has targeted annual sales of Y230 billion for 1990 with emphasis on domestic sales. The 2nd-phase plan is aimed at commercialization of its new drugs in the West and expansion of its drug business in Asia.

The period covered by the 3rd phase plan starting in 1996 is envisaged as the "period of great expansion", during which the company aims at attaining annual sales of Y500 billion and becoming one of the world's top-20 drug firms.

Ciba-Geigy Goes into the Black in FY 1932

Ciba-Geigy (Japan) Ltd., recently issued a report on its business results in fiscal.

According to the report, sales increased by 7.2% over the previous fiscal year's result of Y102,780 million and reached Y110,082 million. Ordinary profit registered Y5.700 million, a 32% rise over the previous fiscal year.

As a result, the company registered a gain of Y 12 million in after-tax profits (a loss of Y40 million in the preceding fiscal year), even allowing for an additional loss concerning SMON disease. Thus, the company moved into the black for the first time in five years.

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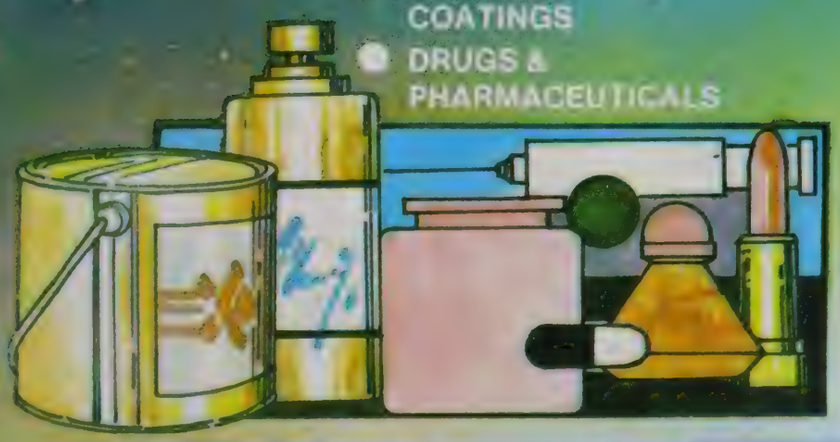

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HIDES AND SKINS: PROBLEMS AND POSSIBILITIES*

WILLIAM CAREY
International Council of Hides, Skins & Leather Traders Associations, London, U.K.

This covers a rather vast subject and I think it would be appropriate for me at the very beginning to make you aware of the tremendous waste which exists in our industry, because in many countries -- some developed but mostly undeveloped -- our raw materials, hides and skins, are not being treated properly and, thus, become unusable for leather, or leather is forced to be downgraded because of the very severe damage to the raw hides and skins.

Most of this damage is avoidable through goodwill and understanding -- understanding of the economic impact that this damage causes to the countries who could supply the sought-after material. $3.5 billion -- do you know how much this is? -- what this represents? Economic well-being of many of the countries involved could be substantially added if farmers/slaughterhouses --large or small -- knew what is involved.

Naturally, the quality of the hides begins with the treatment of the living animal. Climatic conditions have a large impact over which unfortunately nobody can exercise control -- you just have to "live with it".

However, climatic conditions have perhaps a relatively minor affect because the effect is on the grain of the fibre structure -- but still leather can be made, even good leather.

Insect damage is another thing. Grubs, warble flies, can be controlled and minimized if not totally eradicated through extensive use of chemicals -- harmless to humans. However, once started, it must be continued as otherwise the damage will reoccur.

Even in highly developed countries such as the USA, grubs still exist, although the percentage in known areas of grubs have been reduced from 60-70% to 5-10%. Ticks mostly in hot climates are somewhat more difficult to control, although also here by dipping the animal in chemical solutions, this situation can and has been improved.

Scratches due to plants and brush where cattle are raised and feeding on grass -- grain damage due to horns in developing countries is difficult if not impossible to erase, but the hides still would be usable for corrected grain, if treated properly. Flay or take-off -- here we come to the subect which has nothing to do with nature, but only humans, and human error can and should be corrected.

We realize that if we would be willing to increase the monetary return to the farmers or slaughterhouses by paying them somewhat more for hides with a minimum of flay damage, such as knife cuts, holes or scores -- automatically they would improve their work and eliminate such damage to quite some extent. Here again we are speaking of goodwill -- some education -- incentive.

Cure, or lack of cure, or delay in cure after the animal has been killed and the hide removed are of utmost importance, and all of this can be corrected. We all know that a hide is something living and bacteria grow very easily and fast, so immediate cure must start after the animal is killed, and salt or salt brine are still the cheapest and most effective ways to do that. A hide poorly cured, or not sufficiently cured, an hour or two after it is removed from the animal, will permit bacterial growth and, thus, the hide may become unusable for leather.

Whilst in your country you have a good supply of small skins for which you are famous, and out of which you produce a first-rate piece of leather -- for you to become a major exporter of shoes or other leather goods, you also will have to utilize more and more bovine hides. Untortunately, what is being produced locally has a criminally poor flay and, thus, the quantities available for good leather, for good shoes, become very small. What to do?

Important, yes -- as we suggested to start with, improving the quality of your own available raw materials by paying a higher price to your supplier, with the demand to give you a better product, and making any price increase dependent on such a better product. Knife marks, scores, holes and cuts are due to nothing else but carelessness -- not caring whatsoever about you, the tanner and evidently as long as you pay something

---

* Paper presented at the 23rd Tanners Get-Together 1988 held at Central Leather Research Institute, Madras-20 on 28-30, January 1988.

no matter how poor the hide is, presently the producer seems satisfied. Why not meet with them? -- send some people out to see the farmers and slaughterhouses and discuss with them that you are willing to give them a higher return if they give you a better raw material.

Don't ever say "impossible". Don't forget the old proverb which many of you may know, "Where there is a will, there is a way". Certainly your Administration must have a vested interest in the hide, skin and leather industry, as demonstrated by the existence of the Central Leather Research Institute.

Now let me tell you about the worldwide hide situation. The primary producers -- those countries with the largest kill of cattle -- are the U.S.A., the U.S.S.R., the European countries, Argentina, Brazil, Australia and South Africa. However, we should not forget that hides and even some good quality hides are produced in under-developed and developing countries.

Unfortunately, many countries today have restricted the export of their raw material in order to further assist their own leather industries. In our opinion, this is a wrong move -- a self-defeating move -- as eventually countries who are large importers of leather or leather goods may restrict such imports.

Some years ago a recommendation was made and accepted and endorsed by the International Council of Hides, Skins and Leather Traders Associations and the International Council of Tanners that eventually a minimum of 25% of raw material should be available for global export and that a minimum of 25% of local consumption leather goods should be allocated for imports -- a very modest beginning this would be. Both International Councils, the leaders of our industry, endorse free trade.

Although the U.S.A. and Russia are the largest producers of hides, the U.S.A. is by far the largest cattle hide exporter, exporting about 26-27 million hides out of a total production of around 35-36 million. The European community has become a large exporter, as well as Australia, which exports most of their hides. But lately the U.S.S.R. became an exporter as well -- to a small extent -- and primarily to their neighbouring countries. But also the West has received some of their material, and even you have imported some Russian hides.

In almost every country there are good hides and bad hides and of course in-between hides, so that knowledge of what one buys is important. Consequently, even when buying hides of new origin you should familiarize yourself with characteristics of the raw material you intend to buy, and if -- to the best knowledge of your supplier -- it may be suitable for your intended purpose.

Generally, prices of our raw material and finished leather are today on a very high plateau -- directed by supply-and-demand -- but also to some extent influenced by the buying habits of people who entered this industry not long ago, and who have limited knowledge, although they may believe they know all. Korea, in my opinion, is one classical example.

Hide supplies will remain tight in the foreseeable future. Demand worldwide is too big, and therefore because of the prices today, leather goods such as shoes and garments are no longer affordable to everyone, and leather furniture although very popular is today a deluxe item.

Red meat consumption in most developed countries is on the decline, percentagewise, because of health reasons. Medical research tells us of the high cholesterol in certain foods, steaks and red meats being one of them.

As we see little chances for increased production, the only real solution lies in the improvement of the quality of the hides which exists the world-over as mentioned before. $3.5 billion worth of hides which is estimated to be unusable for leather represents about 60 million hides at today's value. Don't you think that it is our duty, all of us connected with this industry, to do something in order to rectify this situation?

There is one more thing which may help this situation. The leather buyers no matter where, are demanding a first-rate piece of leather. And most speak of full grain. In our judgement the very vast majority of the world population buying, for example, shoes, has no idea what is full grain, or slightly corrected grain, or corrected grain. Perhaps even the vast majority doesn't even know the difference between calf skin or cattle hide, sheep or goat or kid skins, except that they are priced differently.

Let us face it: Once we have worn our shoes for a rather limited period of time, they become scuffed, develop folds, and certainly do not look the same any more as when they were new in the store.

What the vast majority wants is a shoe made of a durable piece of leather, and if this is corrected or embossed, in our judgement, makes very little difference. But it must be durable. So what is the answer to this problem?

We feel that a considerable effort must be made to e-educate the leather buyers not to exaggerate in their lemands, and to pay a fair price for a piece of leather vhich may not be perfect at sight. I wish I did not have o speak to you and emphasise to you the problems that ve have in our industry.

No doubt some of these problems have existed for-ever, but with the ever increasing living standards in the most parts of the world, one of the first items which a more affluent person wants is, first of all, better food and, secondly, better wearing apparel, which primarily means shoes and as this demand increases and as we are dependent upon a raw material, the supply of which is only controlled by the consumption of meat, we see at this stage, rather difficult times ahead for our industry.

Nevertheless, we are optimistic for the future, but we all must do our best to collectively improve our raw material supply.

TANNERY EFFLUENT TREATMENT

Dr. V.R. ARUNACHALAM and Dr. P. SUBRAMANIAN
Regional Engineering College, Tiruchi

There are more than 1,000 big and medium sized tan-neries in India. About 12 million pieces of skin and hides weighing about 60 million kgs. are processed per year.

Waste water let out works out to 30-40 litres per kg of skin processed. Trivalant and hexavalent chromium content is abqut 300 gm. per tonne of skin and hide pro-cessed. Waste water from electroplating units also con-tains hexavalent chromium, an undesirable, unhealthy constituent.

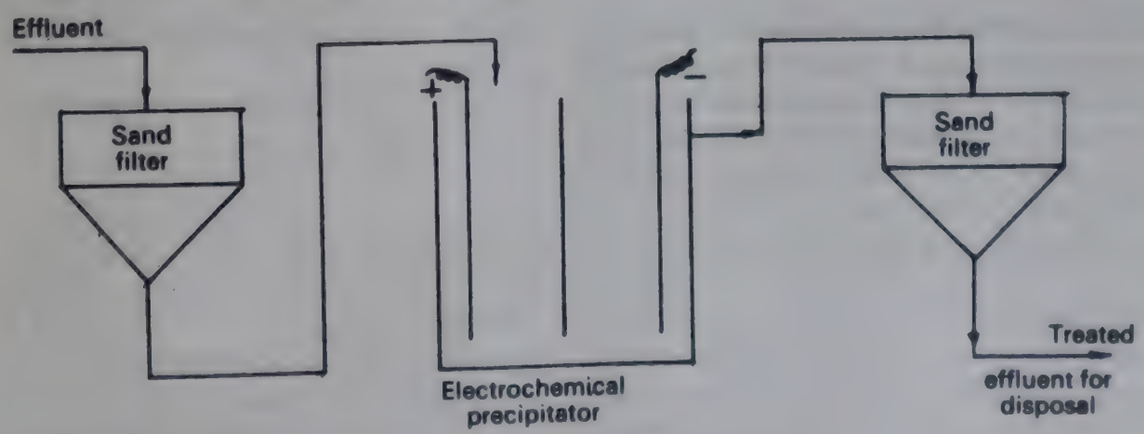
Many industries use chromium salt in cooling water as a corrosion inhibitor. To stop an increase in the dis-solved solids concentration in the water arising from evaporation in the cooling tower, a portion of water is blown down continuously as waste. This also contains significant quantities of hexavalent chromium.

If the effluents are disposed without treatment, there will be surface and ground water pollution problems. Chromium is a carcinogen and causes irreparable effects in the ecological cycles of fish, cattle and human beings. The traditional process of using ferrous sulphate involves two steps -- reaction and neutralisation with a precise pH control. Using acid, alkali and ferrous sul-phate not only increases removal costs but also the dis-solved solids in the treated effluent by more than 100%. Even then, the chromium concentration is much greater than the limit set by the Pollution Control Board, and the effluent is diluted further to meet specifications.

An efficient and reliable process of removing chrom-ium from waste water would be adopted if it is cost effec-tive and the technology simple. Two final year students of REC, Tiruchi have worked out such a process.

The figure gives the detail of the process, which involves filtration of sediments, electrochemical precip-itation of chromium salts and filtration of the precipitated salts. The effluent from the tannery is filtered through a sand bed to remove suspended matter. The filtrate is then admitted into the electrochemical reactor where the chromium salts are precipitated using a DC Power Source. This source may be a conventional one or photo voltaic cells as is used in the present case.

(Courtesy: *THE HINDU*, June 1, 1988)



Schematic diagram of tannery effluent for chromium removal.

LEATHER ABSTRACTS

WET BLUE -- MANUFACTURE AND TRADING, H. Keller, *Leather,* **190,** (4155), 73, 1988.

At a time when the whole leather industry appears to be searching for an alternative to the use of chrome tanning salts this paper suggests that the tanners' best option is to process hides from the blue condition. Buying wet-blue avoids the 'dirty' part of processing, which this large and specialised blueing plants are better equipped to deal with and can make good economic sense to the tanner with forfeiting control, quality or flexibility.

DETERMINATION OF SPRAY MACHINE TRANSFER EFFICIENCY FOR LEATHER FINISHING, G. Stockman, *J. Am. Leath. Chem. Assoc.,* **83,** 125, 1988.

A practical means of measuring transfer efficiency for the finishing of leather on a spray machine has been demonstrated. Solvent based lacquer compounded with a copper pigment was sprayed on side leather with and without microprocessor spray controls. Atomic absorption analysis of the lacquer pigment mixture and of the leather before and after spraying provides the data from which transfer efficiencies are calculated. This method can be used to measure the transfer efficiency of new equipment or to gauge the effectiveness of modifications to existing spray lines and the relative contributions of 'overspray' and 'bounceback' need to be further evaluated.

POSSIBILITIES OF CROSS LINKING BINDERS, H. Traubel, L. Tork, B.Zorn and W. Wenzel, *Das Leder,* **38,** 177, 1987.

Three classes of binders based on acrylate, butadiene and polyurethane resins were tested for wet strength after placing films for 24 hours in water at 20°C. Crosslinking was induced by the addition of azidivine derivatives, two epoxides or a carbodimide compound. In all instances, crosslinking improved the fastness to wet rubbing. In one instance, an ionic crosslinking agent was added, with the same results. Solvent-free top coats with satisfactory properties are more difficult to obtain. A recipe containing a cross linked base consisting of a mixture of the three types of resins enumerated above and an expoxide and a top coat of polyurethane combined with a cross linking carbodimide is presented. Fastness to wet rubbing was very poor in absence and most satisfactory in presence of crosslinking.

A STUDY OF THE HISTOLOGICAL CHARACTERISTICS OF CHINESE HANKOW GOATSKINS, P. Jinshen, W. Shiling, H. Yuixing, Z. Chuanbo and X. Shipping, *J. Am. Leath. Chem. Assoc.,* **83,** 129, 1988.

This paper deals with the study on the histological structure of Chinese Hankow Goatskins employing the scanning electron microscope, transmission electron microscopes and the light microscope. Some of the characteristics studied are the thickeness distribution of the skin, the hair and its distribution and interweaving orientation in the dermal area. The results can predict the leather characteristics as well as the anticipated problems that may arise in the processing.

A NEW PRACTICAL METHOD SATISFYING THE HIGHEST REQUIREMENTS FOR WATER RESISTANT LEATHERS, M. Kaussean and H. Klian, *Das Leder,* **38,** 192, 1987.

The complex affinity of a new waterproofing material based on a fatty acid amide enables it to combine directly with the Cr. tanned collagen fibre. It can be applied in retannages of Cr. tanned hides and of wet blues for white upper leather and also of crushed splits for suede uppers. Testing on the Maeser machine and at the Mally Penetrometer (at amplitudes of 10 and 15%) was terminated without visible water penetration after six hours. Even after splitting the specimens for the Penetrometer into three layers and running them for six hours at an amplitude of 7.5% none of them leaked. Water absorption was very low throughout.

ATHLETIC FOOTWEAR, James Sutton, *American Shoe Making,* **362,** (3), 24, 1988.

Most makers of athletic footwear are heavily into pedorthics to find out how the foot functions under certain sports activities. They are also into the chemistry of rubber, polyurethanes and other materials used in cushioning the foot and absorbing the impact shock and holding the foot in alignment with the shoes. This paper deals with some of the recently presented engineering ideas.

INDIAN LEATHER SCENE

LEATHER LICENSING MADE EASIER

The Union Government has further liberalised the licensing policy for production of finished leather, leather footwear and other leather goods in the organised sector. The objective of the major changes in the policy is to bring about all-round development of the leather footwear and leather goods industry and thereby increase export earnings from this sector.

The liberalisation measures, notified by the Union Industry Ministry through a press note pertain to the locational policy for leather footwear and goods units, broad-banding facility for this sector and removal of restrictions on additional capacity creation in the finished leather manufacturing sector.

It has now been decided that licensing of new units and substantial expansion of existing units for manufacturing leather footwear and leather goods would be allowed in any location, permissible under the general locational policy of the Government. This has been done as the manufacture of leather footwear and leather goods is considered non-polluting.

According to the Ministry decision, all other matters regarding export obligation, clearance from the angle of the Monopolies and Restrictive Trade Practices Act (MRTP) and foreign collaborations would be in accordance with the general policy of the Government. It is, however, stipulated that change of location of the existing units manufacturing leather footwear and leather goods from centrally notified backward areas to the permissible locations will not be allowed.

The Government has also decided to introduce broad-banding in leather goods industry for the purpose of licensing. This has been done to enable the manufacturers of any of the following items to adjust their product mix depending upon the market demands. The broad-banding facility will be available to companies subject to MRTP Act and Foreign Exchange Regulation Act.

The broad-banding facility is made available to the following items. Leather footwear such as shoe uppers, soles, full shoes, leather goods such as suitcases, wallets, bags, belts, gloves and garments. According to the Ministry's press note, the broad-banding facility has been introduced with a view to optimising the utilisation of capacity and providing the necessary flexibility to exporters to meet the changing patterns of demand for leather footwear and leather goods in the international market. The other decision of the Government pertains to the finished leather sector, where the licensing of new units and substantial expansion of the existing units has been liberalised so that good quality finished leather is available for manufacturing leather footwear and leather goods for exports.

As a result, there would be no restrictions on setting up of additional capacity in manufacturing finished leather from now onwards. However, while granting approvals to new units for substantial expansion to the existing units, the Government will keep in mind the need for regional dispersal of such units and also the need for restructuring the capacity in areas which are already saturated.

Such approvals will be granted on a case-to-case basis, in consultation with the State Governments concerned. Manufacture of finished leather in the organised sector will also continue to be taken up, as usual, from the semi-finished stage and not from the stage of raw hides and skins.

These liberalisation measures have been introduced after keeping in mind the Government strategy for leather exports, which aims at maximising export of value-added rather than finished and semi-finished leather. The strategy is the outcome of the Government recognition that the industry has an enormous potential for increasing India's share in the international market for leather footwear and leather goods.

Earlier in February 1986, a similar impetus for increasing export production by this sector was given by revising the licensing policy for leather footwear and goods industry. This review was undertaken after this sector was identified as the thrust area for exports and the need for promoting its growth for export production was recognised.

LEATHER INDUSTRY HAILS POLICY LIBERALISATION

The leather industry has welcomed further liberalisation of policies relating to it including broad-banding but was disappointed that licensing procedure was still being persisted with. Mr. M. Hashim, Chairman of Council for Leather Exports told the press that the footwear industry would have received a real boost had the government accepted the council's plea for dispensing with licensing procedures for units which did not entail an investment of more than Rs. 5 crores.

When licensing requirement has done away with in respect of general industries involving an investment up to 5 crores, it is not.

clear why in respect of the leather industry it is being persisted with, he said. The move to allow creation of additiional capacities is also a welcome decision. In another ten years, the demand for leather by all sections of the industry will be twice the current level of supplies.

KANPUR LEATHER MARKET SLUGGISH

Trading activity in raw hides and skins market slackened owing to shinkage in arrivals with the advent of summer. Conditions were mixed as tanners exhibited keen buying interest in the top varieties while other grades of hides attracted poor demand. According to market sources, arrivals of superior selection materials have dropped to around 20% this summer as against 80% in winter. There were rumours that the Union Government was likely to regulate export of finished leather to ensure its supplies to domestic leather product sector. But no such curbs on export of finished leather have been announced in the new import-export policy valid for three years from April 1 this year. This however, failed to have any immediate impact on market sentiments.

Cow hides: The market ruled firm on poor supplies. Superior selection hides were in good demand from local tanners. Supplies were estimated around 25% of the demand for such varieties. Reflecting this, prices hardened by Rs. 20/30 per piece ranging from Rs. 210 to 350 depending on selection. These prices were higher by Rs. 50-120 per piece compared with those of Rs. 160/230 prevailing a year ago.

Dunger: The market turned slightly easy on withdrawl of demand from Bengal tanners. Local tanners also showed little interest in superior selection. Prices, despite poor receipts, slipped by Rs. 10/20 per piece at Rs. 210 to Rs. 320 per piece depending on the variety.

Buff Hides: Buff hides, which are traded on weight basis, firmed on brisk demand from local tanneries in face of meagre arrivals. Buff hides are sold at Rs. 4 plus 28 to 30 kg salt as against with 27 kg salt a month ago and 24 kg. salt a year ago. The salt factor fluctuates according to demand. For instance, the actual weight of hide is 16 kg., a notional weight of 28 kg. is added to make it 44 kg. The price thus determined is 44 X 4 = Rs. 176 keeping the kg rate of Rs. 4 as constant. Rejections were traded at Rs. 3 per piece while 'picking band' tumbled down by fifty paise at Rs. 9 to Rs. 8.50 per kg.

Heavy Katta: Katta heavy sustained minor losses and prices declined from Rs. 8.00 to Rs. 7.50 per kg. with lesser salt content from 8 kg. to 7.50 kg. on withdrawal of demand in view of poor selections.

Katal: Market ruled quiet owing to poor despatches to Madras and lack of demand from Hapur buyers. Prices ruled around previous levels of Rs. 50-52 per piece. Current prices are lower by Rs. 10 per piece as against those of Rs. 62/64 per piece prevailing last year.

Goatskins: Goatskins firmed up on reduced arrivals, which are drawn mainly from eastern parts of the country, and locally. The entire supplies are consumed by a leading Unnao-based tannery. Prices ranged from Rs. 65 to Rs. 70 per piece.

Sheepskins: A quiet study trend was witnessed in sheepskins. Prices after touching an all time high at Rs. 90-95 per piece nearly three months ago have now stabilised around Rs. 75/80 per piece on slack demand from tanners in wake of fewer overseas enquiries and sustained demand from product sector. Sheepskins in 'lots' was traded at Rs. 65/70 per piece.

TANNERY CAPACITY EXPANSION: TN MAY BE SHUT OUT

A further expansion of tannery capacity in Tamil Nadu may be shut out under the proposed restructuring of existing capacities outlined in the liberalised licensing policy for the production of finished leather and added value items announced recently.

The policy announced had made it clear that while there will be no restrictions on setting up of additional capacity in manufacturing finished leather from now on, the Government will keep in mind the need for regional dispersal of new tanning units before granting approvals. The provision that the need for restructuring the capacity in areas which are already saturated will also be kept in mind in considering proposals for expansion of capacities has generated fears in finished leather industry sources that they may be denied opportunities to expand and grow.

The leather industry, dominated by finished leather and semi-finished leather manufacturers, is already worried that the strategic importance of Tamil Nadu in leather had been reduced in the wake of successive policies relating to leather. Currently the share of Tamil Nadu in the leather trade has come down about 60%. The industry had been repeatedly warning the state government that any further erosion of the state's role will substantially reduce the employment opportunities.

The policy, it is further feared may come in the way of existing units getting a chance to modernise and upgrade technologies. There are several weak tanning units with underutilisation of capacities. Even from a long-term point of view, when the consumption of leather is expected to double from the existing level, the existing tanneries will have to operate at peak levels of efficiency. In fact, it has been estimated that for achieving an export level of 195 million pairs of all types of footwear by the turn of the century, 800 million square feet of leather will be required and another 200 million square feet for making leather garments which will have to be imported. It is argued in industry circles that the cost of augmentation of capacities will be relatively lower, if the uneconomic tanning units are made viable through modernisation and tech-

nological upgradation. The industry is also sorely disappointed that the demand for delicensing upto an investment of about Rs. 1.5 crores has not been accepted, though under the announced policy, it is now possible to set up footwear-making units outside backward areas by getting an industrial licence. Thus industrial licensing is being persisted with in case of footwear-making units, while for general industries, no licence is required if the investment does not exceed Rs. 5 crores.

The announcement that units allowed to be set up will be subject to "general locational policy" meant that they will not be permitted to be located within city limits. The industry is expected to suggest to the centre that the footwear making units, being non-pollutant in nature, should be allowed to be set up within the industrial estates. Such a decision will definitely give a fillip to setting up a cluster of modern footwear-making units all over the country. It will also facilitate the task of achieving the export target of 195 million pairs of footwear by the turn of the century, which is crucial for recording the proposed quantum jump in exports from the leather sector.

LEATHER EXPORT TARGET HIKED

Encouraged by the excellent performance of leather exports in the recent years, the Council for Leather Exports (CLE) has set a target of Rs. 1,640 crores for 1989-90, the terminal year of the Seventh Plan. This marks a substantial hike over Rs. 1,070 crores, originally envisaged in the Seventh Plan working group document. Last year, the exports toppped Rs. 1,244.86 crores, which was 34% more than Rs. 931 crores achieved in the previous year. The revised target for the year was Rs. 1000 crores.

The projections for 1989-90 have been based on the individual action plans drawn up by the exporters at the instance of the Commerce Ministry. CLE has submitted 397 such plans from individual exporters for scrutiny by the Finance and Commerce Ministries. The Cabinet Secretary has convened a meeting of leather exporters in the first week of July, where a concrete strategy for further pushing up the exports would be evolved. The meeting will discuss, among other things, the problems faced by the exporters and also ascertain their specific requirements in the context of the revised targets. This was revealed by Mr. M. Mohamed Hashim, CLE Chairman, while reviewing last year's export performance at a press conference in Madras on June 10.

He said the exports would have crossed Rs. 1300 mark but for a backlog of air cargo worth nearly Rs. 60 crores held up in Delhi and Madras airports in March this year. Of late, this problem has become very serious, threatening to jeopardise the country's export calculations, he observed. Elaborating, Mr. Hashim said the airlines, especially the national carrier in the case of Madras, have been reluctant to carry leather goods as they were low-density, high-volume products. There has been instances when consignments took more than three months to reach the destinations. This has resulted in losses to exporters as the buyers refuse to pay air freight and instead settle for sea freight. The airlines have resorted to such delaying tactics in spite of the fact that the Government has fixed mandatory air freight rates to select destinations as leather is a thrust sector for export. Besides, the airlines have been provided with tentative projections of export by air during the current year.

Mr. Hashim felt that it was high time the airlines, especially the national carrier, took a realistic view of the situation. The Government should ensure that all cargoes are lifted within a week and delivered promptly at the destinations. The CLE chairamn said that West Germany has overtaken the USSR as the single largest importer of leather and leather goods from India. Last year, it imported leather items worth Rs. 228.91 crores which formed 19% of the total exports from the country. The share of other major importing countries are: USSR Rs. 209.36 crores (17%), USA Rs. 154.04 crores (12.5%), Italy Rs. 125.55 crores (10%), UK Rs. 124.21 crores (10%), France Rs. 63.94 crores (5%) and GDR Rs. 50.59 crores (4%). The seven countries together accounted for over 77% of the total exports.

Another important feature was that the share of value-added items in the export basket had gone up to 55.45% in line with the Government policy to this effect. The most spectacular growth was recorded by garments, the export of which spurted by nearly 70% from Rs. 62 crores in 1986-87, to Rs. 106 crores last year. Leather footwear registered a growth of 59% over the previous year. Mr. Hashim pointed out that liberalisation in the import policy in respect of capital goods, components and consumables as also the Government support in the form of a graded incentive policy, weighed in favour of manufacture and export of value-added products have been among the major factors contributing to the increase in export earnings. For the current year, the Council has fixed a target of Rs. 1400 crores. While the industry is optimistic of exceeding this target also, Mr. Hashim said that the Government should consider solving some of the problems coming in the way of increasing the exports.

In the first place, though the Government has recently liberalised the industrial policy in regard to setting up of footwear units only in backward areas, it is felt that it should also initiate steps for creation of a vast modern production base in the country. For this, the Government should allow setting up of footwear units with an investment of up to Rs. 1.5 crores without licence.

Another long-standing demand for the industry pertains to allowing of duty-free import of all types of finished leather under OGL. At present, only bovine leather is allowed duty-free in the finished form. The industry has also been seeking reduction of import duty on PU films, creation of more R & D facilities with the allocation of adequate funds, training of technical manpower and activating the Footwear Design and Development Institute, Delhi.

Mr. A. Sahasranaman, Executive Director, CLE, said India would soon be in an advantageous positiion in the US with the coming to an end on July 1 the Generalised System of Preference (GSP) enjoyed by countries like South Korea, Taiwan and

LEATHER NEWS FROM ABROAD

WILSON MEMORIAL ADDRESS

Dr. K.T.W. Alexander of the British Leather Confederation will talk on "Enzymes utilisation in tannery- catalyst for progress". This will be followed by three symposia dealing with legal/regulatory concerns with organic chemicals in leather tanning and finishing; waste management and dyestuffs and pigments. There will also be a seminar on the injection of chemicals for beaming and tanning processing of leather.

(*Shoe & Leather News,* (3749), 1988)

MICROWAVE DRYING OF LEATHERS

For more than 2 years, Dynavac have been developing a new drying process which makes it possible to dry complete wet leather using the microwave field of radiation. Some of the decisive advantages are the minimum time required, minimal space need, easy control and automatic levelling of moisture content within the leather. The microwave system dries from the inside, vibrating the water molecules which are taken to the outside for evaporation and removal. It is possible to interrupt the drying process when the leather has the correct residual moisture for staking and to eliminate reconditioning completely.

(*Shoe & Leather News,* (3752), 1988).

NEW ANALYTICAL LAB

A laboratory for hides, skins and leather testing is being set up by the United States Hide, Skin and Leather Association (USHSLA) at Cincinnati, Ohio. It will conduct routine analysis on hides and leather, emphasising histological evaluation. Ms Jean J. Tancons will be the Director of the New Laboratory.

(*Leather,* **190,** (4555), 1988).

SWISS SHOE INDUSTRY

Shoe production in Switzerland has in fact shrunk by half in the last 20 years. Production value amounted to 5,524,000 pairs in the third quarter of 1987, an 11% decrease on the production figure of 6,180,000 pairs for the same period in 1986; domestic market production had fallen by 14% from 3,247,000 to 2,794,000 pairs and exports by 7% from 2,932,000 to 2,730,000 pairs. Footwear imports increased from 36,485,000 pairs in 1986 to 38,780,000 pairs in 1987.

(*Leather,* **190,** (4555), 1988).

SEMINARS

Leather Industries of America has announced two more technical education seminars to be held during 1988. A through-the-Blue seminar covering beamhouse and chrome tanning technology will be offered, Nov 7-18, 1988 at the USDA Eastern Regional Centre, Philadelphia, PA. The 22nd Leather Technology Short Course will be held at the Leather Industries Research Laboratory in Cincinnati, Ohio, July 25-August 9, 1988

(*Leather,* **190,** (4555), 1988).

MARKET INFORMATION

Phenol, Rangolite Down

The prices of phenol and rangolite (German) declined in the Bombay Chemicals market owing to better supply position. However MEK and cyclohexanone shot up by Rs. 10 to Rs. 52 and Rs. 50 respectively because of better seasonal demand. Melamine continued to be in short supply. Amongst solvents benzene, toluene and xylene were on the rise.

MPD's price soared suddenly to Rs. 170 with practically no ready material available. The quoted rate was Rs. 170 per kg. K. Acid also had moved up to Rs. 100. Tobias acid was in short supply.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent — and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on 16th June, 1988)

INDUSTRIAL CHEMICALS	Per kg.
Ammonium sulphate	2.00
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	12.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	4.75
Ammonium chloride	3.40
Ammonium nitrate	3.50
Arsenic white powder	21.00
Acrylamide (Resale)	57.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.00
Borax (Granular)	13.50
Borax (Powder)	20.00
Boric acid (Tech.)	21.00
Bisphenol-A	56+57 ST
Butyl carbitol	45.00
Caustic soda (Flakes)	9.20
Caustic soda (Solid)	8.00
Caustic soda (Lye)	7.00
Calcium chloride 70% (solid)	3.25
Calcium chloride 75-80% (fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium Carbonate PPT	3.00
Calcium carbonate (Activated)	3.55
Camphor (Indian)	82.00
Cresylic acid	50.00
Cream of Tartar (Tech.)	70.00
Citric acid (Belgium) (Resale)	43.00
Citric acid (Indian) (Resale)	42.50
Copper sulphate	17.50
Chromic acid	50.00
Cyanuric chloride	120.00
Cobalt oxide	280.00
Carbitol	55+ST

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Dicalcium phosphate		
Ethylene urea		56.00
Ferric chloride (Lumps)		7.00
(Anhydrous)		16.00
Glue flakes		8.45
Glue sheets		6.75
Gohsenol GH-17		120+ST
Hydro	(Resale)	41.50+ST
Hyflosupercell		20+ST
Hexamine	(Resale)	35.00
Industrial Wax		25.00
Litharge		15.00
Lead Acetate (Tech)		28.00
Lithopone		15.50+ST
Magnesium chloride (Crystal)		1.00
Menthol crystal (Flakes)		185+Ex.+ST
Menthol bold		205+Ex.+ST
Menthol crystal bold		245+Ex.+ST
Magnesium carbonate (Japan)		16.00
Magnesium carbonate (Indian)		15.00
Maleic Anhydride (per kg)		
	(Resale)	45.00
Mercury (75 lbs.)		10,000.00
Nickel chloride		90.00
Oxalic acid	(Resale)	24.00
Peppermint oil (Rectified)		90+Ex.+ST
Potassium carbonate (Indian)		19.00
Potassium carbonate (Imported)		21.00
Potassium bichromate		22.00
Potassium phosphate (Mono)		14.00
Potassium phosphate (Di)		14.00
Polyvinyl alcohol (No. 117)		90+ST
Polyvinyl alcohol (No. 173)		
	(Resale)	100.00
Polyvinyl alcohol (No. 208)		120+ST
Paraformaldehyde	(Resale)	21.00
Phthalic anhydride 36%		
	(Resale)	24.00
Pentaerythritol	(Resale)	51.00
Paraffin wax	(Resale)	14.50
Rangolite (German)		80+ST
Rangolite (Czech.)		54+ST
Sodium sulphate (Fine)		6.00
Sodium sulphate (Coarse)		5.00
Sodium sulphide 50-52% (Flakes)		8.00
Sodium sulphide 58-60% (Flakes) (TCL)		21.00
Sodium sulphide pure (Flakes)		12.25
Sodium nitrite	(Resale)	800.00
Sodium chlorite 80% (Spain)		94.00
Santobrite (Indian)		36.00
Soda Ash (Tata)		4.00
Soda Ash (Birla)		3.80
Soda Ash (Imp.)		3.50
Sodium bicarbonate		5.25
Sodium bisulphite		4.50
Sodium silicate		3.00
Sodium acetate		6.00
Sodium alginate		140+ST
Titanium Dioxide (Anatase)		50+ST
Titanium Dioxide (Rutile — RCR_2)		69+ST
Tartaric acid (Crystal)		94.00
Trisodium phosphate		4.80
Thiourea		72+ST
Urea (Tech)		2.75
Vacuum salt		1.00
Zinc Dust		30.00
Zinc Oxide		30.00
Zinc chloride powder (technical)		14.00
Zinc sulphate		4.00

SOLVENTS		Per kg.
Acetic Acid (Glacial)	(Resale)	14.25
Acetic Anhydride	(Resale)	24.00
Acetone	(Resale)	15.00
Adipic Acid		54+ST
Aceto Acetanilide		50.00
Aniline Oil	(Resale)	44.00
Benzoate Plasticiser		45.00
Butyl Acrylate		90+ST
Butyl acrylate		95+ST
Butyl stearate		36.00
Butanol	(Resale)	34.00
Benzyl chloride		24.00
Benzo trichloride		16.00
Benzoyl chloride		22.00
Bromine Liquid		42.50
Chloroform		25+ST
Carbon Tetrachloride		15.50
Cellosolve		45+ST
Cyclohexanone		50+ST
Cyclohexanol		43+ST
Diacetone	(Resale)	35.00
Diethyl Oxalate		34.00
Diethylene glycol (DEG)		39+ST
Dioctyl Phthalate		52.00
Diallyl Phthalate		56.00
Dimethyl Phthalate		28.00
Dioctyl Adipate		52.00
Dibutyl Adipate		42.00
Dipentene		15.00
Dimethylamine 40%		12.00
Dimethylamine 60%		14.00
Ethyl Acetate		20.50
Ethyl Acrylate		49.00
Ethylene Dichloride		11.00
Ethylene Glycol		31+ST
Formic Acid (Imp)	(Resale)	29.00
Formaldehyde	(Resale)	7.00
Glycerine (CP)		50.00
Glycerine (IW)		48.00
Hydrogen peroxide 50%		
	(Resale)	28.50
Isopropyl Alcohol		17.50
Iso Butyl Alcohol		28.00
	(Resale)	30.00
Monoethanolamine	(Resale)	49.00
Melamine		52+ST
Methyl Ethyl Ketone		52.00
Methyl Isobutyl Ketone		36.00
Methyl Acrylate		42.00
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Polyethylene Glycol (No. 400)	42.00
Polyethylene Glycol (No. 500)	42.00
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Polyethyene Glycol (No. 4000)	38.00
Polyethylene Glycol (6000)	50.00
Para Cresol	40.00
Styrene monomer	48+ST
Sorbitol	18.50
Sulphuric Acid	2.10
Trichloroethylene	27.00
Triethanolamine (Resale)	49.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	11.75
Triethylamine	50.00
Vinyl Acetate Monomer	41.30

SOLVENTS	Per Litre
Benzene	10.00
N-Heptane	8.00
N-Hexane	8.75
Methanol	8.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	12.50
Xylene	15.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)	
Alphanaphthylamine	60.00
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Aceto Acetic Ester (Methyl)	60.00
Ammonium Molybdate	200.00
Anthraquinone	75.00
Anthranilic Acid	60.00
2-Amino-4-Nitrophenol (Imp.)	130.00
Blue B. Base (Local)	230.00
Beta Naphthol (Atul)	58.00
Benzidine Dihydrochloride (BDH)	80.00
Bromamine Acid	375.00
BON Acid	110.00
Chicago Acid	280.00
Coach Acid	56.00
C. Acid (Imp.)	260.00
Cyanuric Chloride (Japan)	120.00
2, 4, DNCB	26.00
Dihydrothio PTOS (Imp.)	600.00
Dimethyl Aniline	60.00
Diethyl Aniline	155.00
Di-amino stilbene disulphonic acid	120.00
3, 3-DCB (Imp.)	180.00
Gamma Acid (Atul)	170.00
H. Acid (Atul)	155.00
G. Salt	58.00
Isophthalic Acid	40.00
J. Acid	255.00
J. Acid Urea	275.00
K. Acid	100.00
MDPS (German)	200.00
MNA	80.00
Meta Unido Aniline	140.00
MDP (Local)	170+Ex.+Tax
MPD (Japan)	200.00
Naphthenic Acid	12.00
N-Methyl J. Acid	380.00
N-Methyl Aniline	115.00
Naphthalene (Refined)	23.00
Ortho Anisidine (OA Imp.)	85.00
Ortho Dichloro Benzene (ODCB)	11.25
OT Base	95.00
Para Dichloro Benzene (PDCB)	16.00
Para Anisidine (PA-Imp.)	110.00
Para Anisidine (PA-Local)	87.00
PNA	68.00
Para Cresidine (Imp.)	325.00
Para Amino Azo Benzene (India)	125.00
PNCB	30.00
Para Amino Acetanilide	145.00
1-Phenyl 3-methyl-5 Pyrazolone	120.00
Phenyl J. Acid	350.00
Para Amino Benzoic Acid	170.00
PT Base	88.00
Rhoduline Acid	475.00
Resist Salt	20.00
Resorcinol	142.00
Sodium Naphthionate	65.00
5-Sulpho-Anthranilic Acid	62.00
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Bombay dyes market

(Prices as on 16th June, 1988)

ACID COLOUR	Per Kg.
Acid Violet 4BS	143.00
Acid Maroon V	110.00
Acid Orange II	77.80
Acid Orange IIY	63.05
Acid Red A	107.25
Crosein Scarlet MOO	155.00
Acid Scarlet 3R	99.90
Acid Red 38N	135.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Green V	230.00
Acid Patent Blue AS	250.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	121.95
Acid Black BX	98.40
Acid Black Wax	135.50
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

DIRECT COLOURS	Per Kg.
Yellow 3GX	88.10
Gun Yellow RCH	124.00
Fast Yellow GCH	141.15
Yellow CFG Hly. Conc.	312.00
Fast Yellow GS	111.65
Fast Yellow CHRS	95.45
Viscose Orange A	166.15
Fast Orange GR	133.75
Red	96.90
Dark Tan	78.25
Red IIR	72.55
Red 4B	169.10
Bordeaux BW	132.30
Fast Scarlet 4BS	166.55
Red 12B	170.55
Bordeaux Hly. Conc.	194.00
Cotton Red N	117.05
Brill. Fast Helio B	278.00
Brill. Fast Helio 2B	297.00
Brill. Fast Helio 2RS	136.20
Brill. Fast Helio BS	116.10
Brill. Violet Extra	126.40
Blue 2B	86.60
Blue G	170.50
Sky Bue FB	188.25
Copper Blue GR	147.00
Fast Greenish Blue GL	114.60
Developed Black BT	116.10
Blue NB-2B	300.20
Blue NB-2BC	185.30
Developed Black NB-GHB	185.30
Green B	111.65
Green NB-B	188.25
Green 2B-N	188.25
Brown MR	154.40
Brown CN	107.25
Golden Brown G	140.35
Catechin G	120.50
Omega Tan	126.40
Catechin GS	102.80
Black E Hly Conc.	142.60
Black E Extra Hly. Conc.	142.60
Black NB-ER Hly. Cone.	310.50

DISPERSOL COLOURS	Per Kg.
Yellow 6G Powder	143.80
Red B 3B Powder	247.80
Red B 2B Powder	323.20
Red CB Powder	439.15
Red D2B Powder	477.40
Violet C 4R	521.90
Blue BG Powder	235.45
Blue BN Powder	103.75
Blue D 2R Powder	476.25
Navy BT Powder	243.90
Blue B 2G Powder	210.20
Black BT Powder	182.60
Blue BR Powder	390.20
Yellow 7GL	338.60
Yellow 5RX	218.80
Yellow 3G	367.25
Yellow	140.00
Yellow AL	135.30
Yellow Brown REL	247.50
Yellow FFL	463.60
Gold Yellow GG	259.70
Pink REL	247.00
Red REL	468.65
Red 2B	327.40
Red FB	324.20
Red Violet FBL	469.85
Orange 3R	196.65
Violet 3R	280.00
Violet RL	275.45
Violet 6R	485.75
Scarlet RR	214.80
Rubine 3B	223.00
Rubine CB	364.90
Blue GL	318.90
Blue BGF	636.50
Navy Blue RF	270.40
Brown 3REL	200.40
Black GEL	324.20
Dark Brown 3B	317.40

BASE COLOURS	Per Kg.
Fast Yellow GC	80.20
Fast Orange GC	135.45
Fast Scarlet R	166.90
Fast Scarlet RC	126.65
Fast Scarlet RCR	99.05
Fast Scarlet G	121.65
Fast Scarlet GN	91.50
Fast Scarlet GG	72.70
Fast Scarlet GGS	72.75
Fast Red B	203.20
Fast Red RC	119.15
Fast Red R Flakes	149.25
Fast Red TR	166.80
Fast Red TR Oil	183.15
Fast Red RL	237.10
Fast Red KB Oil	201.90
Fast Bordeaux GP	201.95
Fast Garnet GBC	94.00
Fast Violet B	505.60
Fast Blue BB	521.40

NAPHTHOL COLOURS	Per Kg.
ASG	217.00
AS	143.00
ASSW	279.75
ABBS	189.15
ASBO	195.65
ASD	175.50
ASOL	179.35
ASTR	279.75
ASPH	279.75
ASE	196.05
ASEI	184.40
ASLB	1632.60
ASBT	1817.00
ASWG	143.00
ASSG	397.70
ASSR	480.50

PROCION COLOURS	Per Kg.
Golden Yellow HR	181.80
Brill. Yellow H4G	117.85
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	166.95
Yellow H-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	243.95
Yellow M GR	326.05
Brill. Yellow M4G	177.10
Brill. Yellow M8G	332.30
Yellow M 3R	217.60
Brill. Orange H 2R	241.85
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	169.45
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.30
Brill. Red H-F3B	243.45
Brill. Magenta HB	167.00
Brill. Red M 5B	98.90
Brill. Red M 8B	173.70
Brill. Pink MB	137.10
Brill. Magenta MB	121.55
Brill. Purple H-3R	180.20
Brill. Purple H-7R	175.40
Navy Blue H 3R	298.50
Brill. Blue H-GR	366.55
Brill. Blue H 5G	173.10
Blue H 5R	283.85
Brill. Blue H 7G	178.70
Brill. Blue H 7RX	358.15
Turquoise HA	234.45
Supra Blue H-3RP	335.70
Supra Turquoise H 2GP	181.50
Blue H-ERD	305.80
Navy Blue H ER	258.60
Blue H 5RX	269.30
Navy Blue M 3R	310.95
Brill. Blue MR	331.70
Brill. Blue M RX	214.20
Brill. Blue M-G	382.30
Blue M 4GD	344.60
Navy Blue M RB	318.75
Turquoise M-G	197.85
Brill. Blue M GX	302.50
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide (per kg.)	285.00
Green H 4BD	269.80
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	283.35

SULFUR COLOURS	Per Kg.
Navy Blue	99.85
Green G	198.55
Black Grains Extra	63.05
Black Grains OG	64.55
Black GXE Conc.	61.60
Black GXE	52.75
Black GXR	61.60
Black Grains 800	54.20
Black EXR Grains	64.55
Black EXR Grains 800	51.25

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Powder Fine	673.15
Yellow 5G Supra Disperse	439.30
Yellow 5G Acra Con.	628.75
Yellow 3R Powder	588.85
Gold Orange 3G Pdr. Fine	952.15
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	601.30
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	997.80
Brill. Red 3B Supra Disp.	713.20
Brill. Purple 4R Conc. Pdr.	470.75
Brill. Purple 3R Acra Powder	690.85
Brill. Purple 2R Hly Conc.	597.90
Brill. Purple 4R Supra Disp.	500.05
Brill. Purple 2R Acra Conc.	625.95
Blue R Powder Fine	542.15
Blue BC Conc. Pdr. Fine	522.50
Blue BC Acra Conc. Pdr. Fine	762.70
Blue R Conc. Pdr. Fine	577.65
Blue RR Supra Powder	629.35
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	389.25
Blue BC Supra Disp.	359.40
Jade Green XBN Powder Fine	438.20
Jade Green XBN Acra Conc. Powder	823.90
Jade Green 2G Pdr. Fine	419.65
Jade Green 2G Ptg. Faste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	496.00
Olive Green B Pdr. Fine	399.90
Olive D Pdr. Fine	444.30
Olive Green B Supra Disp.	308.26
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive R. Pdr. Fine	422.96
Olive D Supra Disp.	361.70
Olive R Supra Disp.	363.90
Olive D. Ptg. Paste	193.00
Olive Green B. Ptg. Paste	199.10
Olive Green B Acra Conc.	542.75
Olive R Acra Conc.	640.00
Olive Green B Acra Conc.	542.75
Brown R Pdr. Fine	835.00
Brown G. Pdr. Fine	795.00
Brown R Pdr. Fine	659.75
Dark Brown 3R Pdr Fine	685.00
Brown G. Supra Disp.	449.90
Brown 2G Supra Disp.	554.00
Brown R Supra Disp.	422.95
Brown BR Powder	719.00
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	414.55
Brown G Acra Conc.	733.95
Brown R Acra Conc.	766.00
Grey M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	330.35
Direct Black AC Pdr. Fine	474.70
Direct Black CH Supra Disp.	393.20
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: JUNE 17 (NNS) — Mercury suffered a steep fall of Rs. 250 per flask in the Delhi chemicals market during the week under review, on hesitant offerings by stockists due to tight credit conditions, says NNS. Menthol prices also slipped by Rs. 30/35 while sodium nitrite quoted higher by Rs. 25 on poor arrivals. Turnover was moderate.

Mercury slipped sharply from Rs. 10,500 to Rs. 10,250 per flask owing to nervous selling by stockists due to tight money market and slack industrial demand. On reports of about 500-600 kg of the commodity commenced from Sumbaipur and Muradabad areas of U.P., menthol flake and bold medium suffered losses by Rs. 33/35 at Rs. 190, Rs. 210 and Rs. 202 per kg. respectively. Mentha oil being offered lower at Rs. 150 against Rs. 170. DMO eased by Rs. 5 at Rs. 80 per kg.

Boric acid technical slipped by Rs. 30 at Rs. 1020 on improved supply. Borax granular and crystal eased at Rs. 575 and Rs. 600. Caustic soda flake dropped by Rs. 7/11 at Rs. 403/404 per 50 kg. thanks to renewed offerings from Modi Company. Soda ash PNFC and soda bicarb turned easy by Rs. 2/5 at Rs. 270 and Rs. 280 on better inflow. In the absence of demand, tartaric acid moved down by Rs. 25 at Rs. 6375. Citric acid remained quiet at Rs. 2050/2400.

Following poor arrivals from Assam along with keen demand paraffin wax advanced by Rs. 10 at Rs. 610. In the absence of dwindling stocks position along with fall in fresh arrivals sodium hydro sulphite Tamilnadu went up by Rs. 5 at Rs. 43 per kg. Hydro Kalali moved up by 50 paise at Rs. 40.50 and Damosha hydro quoted higher at Rs. 39 against Rs. 38 in anticipation of hike its prices by manufacturers in near future- Rangolite Germany looked up from Rs. 65 to Rs. 71. sufolight declined by Re. one at Rs. 48.

In the absence of fresh arrival, sodium nitrite went up by Rs. 25 at Rs. 750/775. Sodium nitrate also sild higher at 450 per 50 kg.

Dull trading was featured in dyes and colour in this trading.

(DELHI MARKET RATES AS ON JUNE 17, 1988)

Ammonia Bicarb (per 25 kg)	118.00
Mercury (per flask)	10,250.00
Soda ash (per bag)	270.00
Ammonium chloride (per 50 kg)	125-180.00
Caustic soda solid	No Stock
Caustic soda flakes (per 50 kg)	403-404.00
Citric acid (per 50 kg)	2050-2400.00
Stable Bleaching Powder Shriram (per 25 kg)	95.00
Stable Bleaching Powder KCI (per 25 kg)	85.00
Stable Bleaching Powder MODI (per 25 kg.)	90.00
Sod. Bicarbonate (per 50 kg)	280.00
Sod. Hydro Sulphite (per kg)	39-43.00
Rangolite (per kg)	48.00
Boric acid Technical (per 50 kg)	1050.00
Paraffin wax (per 50 kg)	610.00
Tartaric acid (per 50 kg)	6,375.00
Borax Granular (per 50 kg)	575.00
Borax Crystal (per 50 kg)	600.00
Sodium Nitrate (per 50 kg)	450.00
Sodium Nitrite (per 50 kg)	750-775.00
Camphor Powder (per kg)	87.00
Camphor Thal (per kg)	97.00
Menthol Medium (per kg)	190.00
Menthol Flakes (per kg)	202.00
Menthol Bold (per kg)	210.00
Glycerine (per kg)	42-43.00
Sodium Silicate (per quintal)	200-250.00
Hexamine (per kg)	35.00
Acetic Acid Glacial (per kg)	13-13.50
Copper Sulphate (per quintal)	1800-2100.00
Formic acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Hydrogen Peroxide (per kg)	30-32.00
Calcium Carbonate (per tonne)	2500-4000.00
Acid Slurry Soft (per kg)	24.00
Acid Slurry Hard (per kg)	32.00
Phosphoric Acid (per 50 kg)	825.00
Pot. Nitrate (per quintal)	900-1200.00
Pot. Permanganate (per 50 kg)	2300.00
Sod. Bichromate (per 50 kg)	1050-1150.00
Tri-Sod. Phosphate (per 50 kg)	325-360.00
Titanium Dioxide Anatase (per kg)	47.50
Titanium RC-822 (per kg)	64.00
Zinc Oxide (per mt)	32,000-40,000.00
Phenol Carbolic Acid (per kg)	33.00
Carbon Tetrachloride (per kg)	19.00
Chloroform (per kg)	28.00
Sodium Sulphate (per 50 kg)	160-170.00
Naphthalene Balls (per 50 kg)	1400.00

DYES & COLOURS	per kg
Naphthol AS	150.00
Naphthol ASG	235.00
Naphthol ASBS	200.00
Naphthol ASTR	302.00
Naphthol ASOL	191.00
Naphthol ASBO	208.00

DIRECT DYES	(per kg)
Black E. Conc.	92-155.00
Diazo Black B.T.	125.00
Green B.	119.00
Blue 2-B	86.00
Sky Blue FB	200.15
Basic Auramine O' Conc.	55-100.00
Basic Rhodamine B.500%	220-320.00
Basic Methylene Blue	92-130.00
Basic Violet	142-160.00
Basic Malachite Green	160-185.00
Acid Orange	45-52.00

Madras Market

Chemical market was quite active during the week with good enquiries of Hydros, Sodium Cyanide, Caustic, Methanol etc. Hydros prices further improved due to delay in start up of local manufacturer, TCPL. Acetone prices improved with the reported stabilisation of prices by the manufacturers. Caustic prices ruled firm at Rs 440/- per bag of 50 kgs. Soda Ash availability was better with good supplies from all manufacturers. Supply position of Formaldehyde continues to be stiff with poor arrivals and prices are ruling high.

(MADRAS MARKET RATES AS ON JUNE 18, 1988)

Acetic Acid — Glacial (per kg)	17.00
Acid Slurry (Soft) (per kg)	26.00
Aluminium Sulphate Iron free (per tonne)	1,700.00
Ammonium Bi-carbonate (per 25 kg.)	125.00
Ammonium Chloride SPIC (per tonne)	2000.00
Bleaching Powder — Mettur (per 25 kgs. bags)	100.00
Borax Granular	660.00
Cresylic Acid 100% (per kg)	86+E.D.
Meta Cresol 40/42% (per kg)	47.00+E.D
Para Cresol 80/85% (per ton)	60+E.D
Caustic Soda Flakes (Mettur) (per ton)	8,800.00
Caustic Soda Flakes (Andhra Sugar)	8,800.00
Citric Acid — Indian (per kg)	42.00
Copper Sulphate (per 50 kg)	1060.00
Formic Acid (India) (per kg)	27.00
Formaldehyde (per kg)	8.00
Glycerine (per kg)	42.00
Hydrosulphite of Soda TCPL (per kg)	38.00
Hydrosulphite of Soda IDI (per kg)	42.00
Hydrosulphite of Soda BASF (per kg)	43.00
Hydrogen Peroxide (India) (per kg.)	35.00
Hyflo Supercell	19.50
Magnesium Carbonate Light	18.00
Potassium Bichromate (per kg)	24.00
Phosphoric Acid (per kg)	18.00
Phthalic Anhydride (per kg)	24.00
Pentaerythritol (per kg)	62.00
Paraffin Wax (per kg)	13.50
Oxalic Acid (per kg.)	20.00
Soda Ash (TAC) (Per 75 kg)	306.00
Soda Ash (TATA) (per 75 kg)	310.00
Sodium Cyanide Indian (per kg.)	47.00
Sodium Cyanide Degussa (per kg)	70.00
Sodium Bichromate (per kg)	16.50
Sodium Bicarbonate (per 50 kg)	280.00
Sodium Nitrite (per 50 kg)	700.00
Sodium Nitrate (per 50 kg)	425.00
Sodium Silicate (per tonne)	4500.00
Sodium Sulphate (per tonne)	3500.00
Sodium Sulphide Flakes (per tonne)	13,000.00
Sodium Bi-sulphite (per 50 kg)	280.00
Stearic Acid (per kg)	32.00
Trisodium phosphate (per 50 kg)	385.00
Titanium Di-oxide Indian TTP (per kg)	48.00
Titanium Di-oxide Indian Rutile (per kg)	58.00
Urea Tech (per tonne)	2800.00
Zinc Oxide (per kg.)	34.00
Zinc Chloride Powder (per kg.)	13.00
Zinc Sulphate (per tonne)	4,500.00
Di-octyl phthalate (per kg.)	46.00
Di-butyl Phthalate (per kg.)	47.00
Hexamine (per kg)	34.00

SOLVENTS

Acetone (I.O.C.) (per kg)	17.50
Isopropyl Alcohol NOCIL (per kg.)	21.60
Diacetone Alcohol NOCIL (per kg)	28.50
Benzene SAIL (per kg)	16.00
Diethylene Glycol NOCIL (per kg)	33.00
Butanol NOCIL (per kg)	35.00
Toluene SAIL (per litre)	12.00
Xylene IPCL (per litre)	16.00
Phenol HOC (per kg)	28.00
Turpentine (per litre)	16.00
Sorbitol (per kg)	35.00
Trichloroethylene MCIC (per kg)	23.50
Carbon Tetra Chloride (per kg)	15.40
Chloroform (per kg)	25.00
Methylene chloride (per kg)	24.00
Methyl Ethyl Ketone (per kg.)	42.00
Cellosolve (per kg)	50.00
Triethanolamine (per kg)	23.50
Ethyl Acetate (per kg.)	22.00
Butyl Acetate (per kg)	38.00
Methanol (per litre)	10.00

MATERIALS IMPORTED

BOMBAY
(Cost of Imported Item is CIF Value)
(From 1-2-83 to 2-2-83)

ACRYLIC ACID: From Japan: Shree Vallash Chemicals, 2 Mts., Rs. 52,583.

A. H. SALT: From France: Nymould Pvt. Ltd., 17,500 kgs., Rs. 5,25,992.

ALDEHYDE: From FRG: Hindustan Lever Ltd., 225 kgs., Rs. 41,014.

ALPHA METHYL STYRENE 99.5%: From Italy: ABS Plastics Ltd., 12.96 Mts., Rs. 1,85,089.

ALPHA NAPHTHOL: From China: Monomer Chemical Inds., 1,000 kgs., Rs. 46,740.

ALPHA OLEFINS: From USA: The Dharamsi Morarji Chemicals, 520.952 Mts., Rs. 53,77,204.

ANETHOLE: From UK: Naarden India Ltd., 200 kgs., Rs. 42,479.

AROMATIC CHEMICALS : From FRG : SPAC Aromas, 50 kgs., Rs. 6,519.

ARSENIC TRIOXIDE: From FRG: Pannacle Exports, 17 Mts., Rs. 1,21,394.

BISPHENOL-A: From Brazil: Southern Sea Foods Pvt. Ltd., 10,000 kgs., Rs. 1,64,116. From Japan: Cibatul Ltd., 5,000 kgs., Rs. 1,07,111.

BUTANOL: From FRG: Suparna Chemicals P. Ltd., 12,480 kgs., Rs. 1,34,764.

CAPROLACTUM: From Belgium: JK Synthetics Ltd., 2,22,000 kgs., Rs. 54,47,511; From Netherlands: The National Rayon Corpn. Ltd., 170 Mts., Rs. 41,71,517.

CARBAZOLE: From Japan: Pigments & Allieds, 3,000 kgs., Rs. 1,57,750.

CARBOFURAN (CARBAMATE PESTICIDES): From USA: Rallis India Ltd., 18,000 kgs., Rs. 29,42,262.

CYANURIC CHLORIDE: From Japan: Jagson Industries, 250 kgs., Rs. 10,832. From Switzerland: Paras Enterprises, 8,000 kgs., Rs. 3,66,364.

CYCLOHEXANOL: From Netherlands: Resonance Laboratories P. Ltd., 2,090 kgs., Rs. 51,088.

CYCLOHEXANONE : From FRG: Hindustan Ciba Geigy, 1,05,300 kgs., Rs. 16,61,070; Synthetics & Polymers Ltd., 8,000 kgs., Rs. 1,32,584.

DESMODUR: From FRG: Mahindra Engg. & Chemical Ltd., 5,000 kgs., Rs. 2,03,700

DESMODUR PA50: From FRG: Kaygee Foam Pvt. Ltd., 2,000 kgs., Rs. 72,706.

DICHLORO ACETYL CHLORIDE: From Japan: Synthochem, 1,000 kgs., Rs. 38,386.

DICHLORO BENZENE: From Japan: Jal Pvt. Ltd., 500 kgs., Rs. 38,626.

2,3 DICHLORO 1,4 NAPHTHAQUINONE: From Japan: PDI Chemicals Pvt. Ltd., 500 kgs., Rs. 76,246.

DICYCLOPENTADIENE. From Netherlands: Hindustan Lever Ltd., 15,834 kgs., Rs. 1,78,852.

DIETHYL HYDROXYLAMINE 85%: From USA: Synthetics & Chemicals Ltd., 181.44 kgs., Rs 20,648.

DIHYDRO MYRCENOL: From FRG: SPAC Aromas, 25 kgs., Rs 4,889.

DIMETHYL ACETAMIDE : From FRG: Garware Plastics and Polyester Ltd., 10,070 kgs., Rs. 2,74,557.

P-DIMETHYL AMINO O-METHYL PHENYL PHOSPHONIC ACID: From FRG: Hoechst India Ltd., 10,000 kgs., Rs. 15,63,722.

DI METHYL FORMAMIDE : From FRG: Ranbaxy Laboratories Ltd., 14,820 kgs., Rs. 1,82,791,

DI METHYL SULPHAMIDE: From France: Burroughs Wellcome (India) Ltd., 7,980 kgs., Rs. 1,68,878.

DI NITRO ORTHO TOLUAMIDE: From France: M. J. Pharmaceuticals Ltd., 2,000 kgs., Rs. 2,10,156.

DIETHYL PHTHALATE: From Korea: Capriliain india Ltd., 18.8 Mts., Rs. 2,67,761.

DIPROPYLENE GLYCOL: From USA: Rallis India Ltd., 8 101.22 kgs., Rs. 89,401.

EPICHLORO HYDRINE: From Japan: German Pemedies Ltd., 2160 kgs. Rs. 43,077.

ETHYOXY METHYLENE MALONIC ACID ESTER: From FRG: Cipla Ltd., 2000 kgs. Rs. 3,03,808

2,6 ETHYLAMILINE: From Switzerland: Montari Inds. Ltd., 29.-640 kgs. Rs. 8,03,129.

ETHYLENE ACETATE CO POLYMER: From Canada: Polyolefin Inds. Ltd., 66 mts Rs. 8,74,032.

ETHYLENE GLYCOL MONOETHYL ETHER: From USA: Asian Paints India Ltd., 15,341 kgs., Rs. 1,87,229. Goodlass Nerolac Paints Ltd., 14, 720 kgs. Rs. 1,73,914.

ETHYLENE VINYL ACETATE COPOLYMER: From USA: Apuraj Chemicals Pvt. Ltd., 3,402 kgs., Rs. 66,253.

ETHYL MERCAPTAN: From NETHERLAND: Cyanamid India Ltd., 19,000 kgs. Rs. 4,04,157.

ETHYL MERCAPTAN: From Netherlands: Voirho Ltd., 12.480 kgs. Rs. 2,47,907.

FATTY ALCOHOL: From USA: Hico Products Ltd., 5,062 kgs., Rs. 74,922.

FORMIC ACID 85%: From FRG: Mahendrakumar & Co., 30.04 Mts., Rs. 2,19,474.

GUM ARABIC: From Nigeria: International Commercial Enterprises, 20,000 kgs., Rs. 1,03.-886.

GUM ROSIN: From China: Mercury Paints & Varnishes Ltd., 17.55 Mts., Rs. 1,22.122: The Simplex Mills Co. Ltd., 17.55 Mts., Rs. 1,16,207.

HEDIORE: From Switzerland: Davar Aromatics Pvt. Ltd., 500 kgs., Rs. 2,16,396.

HEXACHLOROCYCLOPENTADIENE: From USA: Excel Industries Ltd., 100.01 Mts., Rs. 23,17,741.

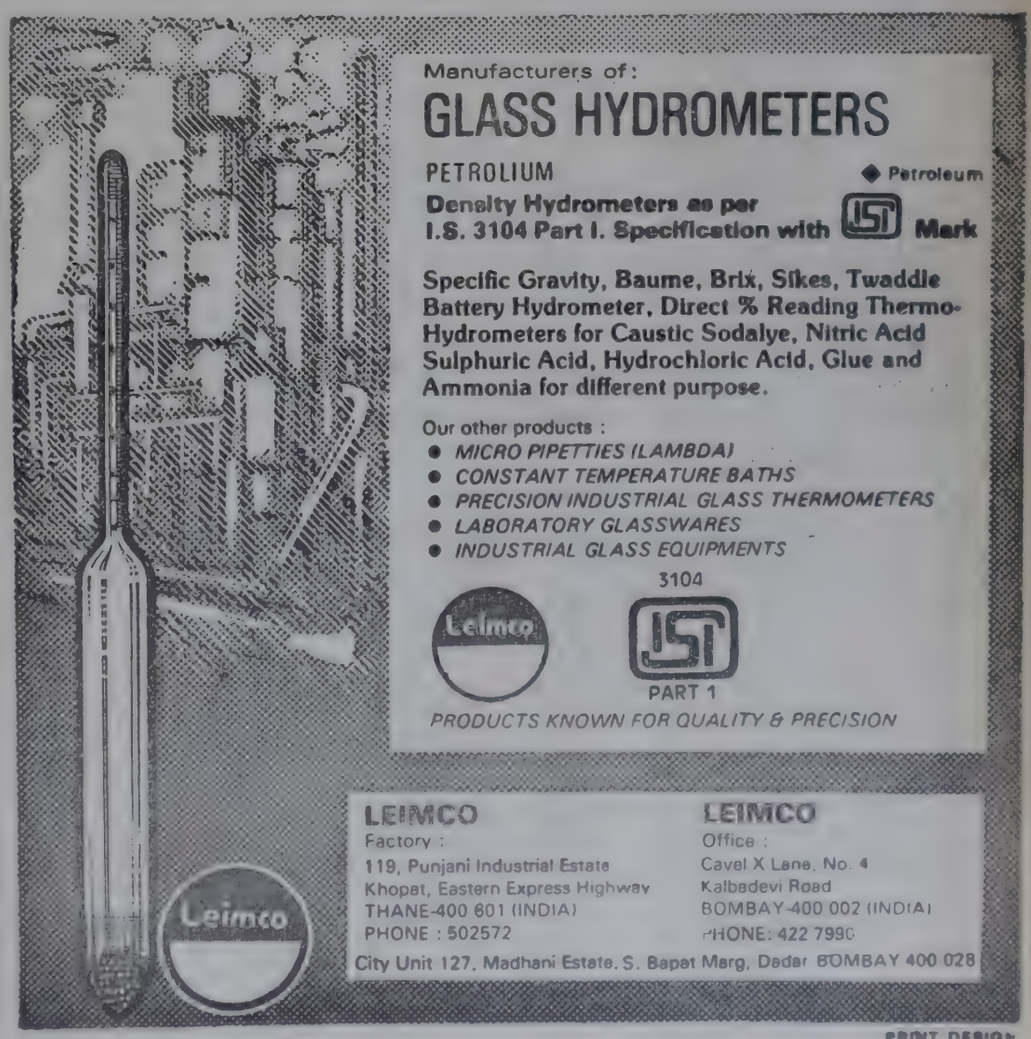
HYDROGEN PEROXIDE: From Italy: Kilachand Devchand & Co, Ltd., 20.65 Mts., Rs. 1,78,289; From Spain: Usha Chemicals Co., 12,600 kgs., Rs. 1,09,116.

HYDROXY PROPYL ACRYLATE: From UK: Aquapharm Chem. Co. Ltd., 2,030 kgs., Rs. 67,207.

HYDROXY PROPYL METHYL CELLULOSE: From Japan: The Boots Co. (India) Ltd., 550 kgs., Rs. 1,35,928.

IODINE; From FRG: Ifiumik Pharmaceuticals Pvt. Ltd., 1,050 kgs., Rs. 2,13,885.

IODINE CRUDE: From Japan: LB Fine Chemicals P. Ltd., 1,500 kgs., Rs. 3,43,732.



ISOOCTYLTHIOGLYCOLATE : From France: Bharat Plastic Inds., 975 kgs., Rs. 45,424.

ISOPHORONE: From Japan: A. S. Corporation, 5,130 kgs., Rs. 80,591.

LACTOSE: From Netherlands : Burroughs Welcome (I) Ltd., 19,000 kgs., Rs. 2,31,634.

LACTOSE BP/IP: From Netherlands: Hoechst India Ltd., 19,000 kgs., Rs. 2,47,443.

LACTOSE IP POWDER: From Netherlands: Parke Davis (India) Ltd., 5,000 kgs., Rs. 62,404.

LILIAL: From FRG: Hindustan Lever Ltd., 2,500 kgs., Rs. 5,91,-315; From Switzerland: N. Ranga Rao & Sons, 1,140 kgs., Rs. 71,270.

LINALYL ACETATE: From FRG: Hindustan Lever Ltd., 5,950 kgs., Rs. 7,37,131.

L-LYSINE MONO HCL USP: From Japan: Sarabhai International Ltd., 1,000 kgs., Rs. 64,-916.

MAGNESIUM OXIDE: From: Japan: Swastic Rubber Products Ltd., 2,000 kgs., Rs. 36,352.

MERCURY: From Switzerland: Excel Industries Ltd., 100 Mts. Rs. 3,89,497.

METHYL CHLOROFORMATE: From Hungary: Cipla Ltd., 7,000 kgs., Rs. 1,36,324.

METHYLENE CHLORIDE: From Netherlands: Benzex Labs. Ltd., 18,615 kgs., Rs. 1,16,975.

METHYL ISOBUTYL KETONE: From Taiwan: M. J. Exports Pvt. Ltd., 6.6 Mts., Rs. 73,693; 9.9 Mts., Rs. 1,10,539.

METHYL KETONE: From FRG SPAC Aromas, 5 kgs., Rs. 1,263.

MORPHOLINE: From USA: Southern Seafoods Pvt. Ltd., 15,023 kgs., Rs. 3,41,333.

NAPHTHALENE CRUDE: From Australia: Amal Rasayan Ltd., 88.1 Mts., Rs. 4,57,530; From Canada: Amoica Chemical Inds., 15 Mts., Rs. 93,479, Sajjan Impex Pvt. Ltd., 30,000 kgs., Rs. 1,90,644.

OCTYL PHENOL: From FRG: PDI Chemicals P. Ltd., 2,500 kgs., Rs. 56,802.

OLIVE OIL PURE: From Italy: Jay Scientific Co., 1,265 kgs., Rs. 62,605.

PARA CUMENE: From USA: Bombay Dyeing & Mfg. Co. Ltd., 17,363 kgs., Rs. 7,83,190.

PARA TERTIARY BUTYL PHENOL: From Japan: Keshvlal Talakchand, 5,000 kgs., Rs. 84,391.

PARAXYLENE: Reliance Inds. Ltd., 3,145.725 Mts., Rs. 1,66,-68,023.

PHENOL: From Japan: BASF India Ltd., 50,000 kgs.. Rs. 6,29,687.

PHENOL BLACK POLYISOCYNATE: From FRG: Dr. Beck & Co. (I) Ltd., 500 kgs., Rs. 27, 296.

PHENYL XYLYL ETHANE: From Japan: Madhav Capacitors Pvt. Ltd., 3 Mts., Rs. 81,795.

PIVALOYL CHLORIDE: From FRG: Tini Pharma (P) Ltd., 3,060 kgs., Rs. 2,12,927.

POLYCARBONATE RESIN : From FRG: Jamnadas Murlidhar Jaisingh, 13,960 kgs., Rs. 4,93,057.

POLYPROPYLENE: From Czechoslovakia: Associated Plastic Inds., 14 Mts., Rs. 1,60,797.

POLYVINYL ALCOHOL: From Japan: Nutan Mills Ltd., 1,000 kgs., Rs. 24,699. Pidilite Ind. Pvt. Ltd. 52,000 kgs., Rs. 11,-91,866. Polymers & Allied Chemicals, 4 Mts., Rs. 83,092, Taloja Resins & Adhesives P. Ltd., 32 Mts., Rs. 7,06,292.

PROPIOPHENONE: From Japan: Wockhardt Ltd., 15,200 kgs., Rs. 7,73,594.

PROYPLENE GLYCOL TECHNICAL: From USA: Bakelite Hylam Ltd., 34,400 kgs., Rs. 3,55,-439.

RESORCINOL TECH. FLAKES: From FRG: Shilpa International 2,000 kgs. Rs. 96,076.

ROCK PHOSPHATE: From Jordan: Rashtriya Chemicals & Fertilisers 14,250. Mts. Rs. 1,-07,49,477. From Morraco: Ganges Fertilizers and Chemicals, 2000 mts. Rs. 14,82,592.

ROCK PHOSPHATE: From Morraco: The Dharamsi Morarji Chemical 4,500 Mts. Rs. 24,-93,126.

SLUDGE OIL: From Italy: Supreme Marine Works. 13.6 Mts. Rs. 13,600, From P.C.I.: GN Marine Works, 20 Mts., Rs. 20,000. From U.K.: BK Marine Works, 18.5 Mts. Rs. 18,500.

SODIUM FERROCYANIDE : From U.K.: Citurgia Bio Chemicals Ltd., 20,000 kgs., Rs. 3,04,-352.

SODIUM LAURYL SULPHATE: From FRG: 11,000 kgs., Rs. 3,00,254.

SOYA LECITHIN: From Brazil: Monitrik Baking Inds. Ltd., 3,000 kgs., Rs. 20,059. From Brazil: NM Chemicals, 7.4 Mts. Rs. 48,-038. Coates of India Ltd., 3,000 kgs., Rs. 22,007.

SULPHUR IN BULK: From Kuwait: Tarapur Acid and Alkali P. Ltd., 2,000 Mts. Rs. 31,21,-587.

TEREPHTHALDIALDEHYDE : From FRG: Indian Dyestuff Inds. Ltd., 1.5 Mts. Rs. 5,49,990.

TEREPHTHALIC ACID PURE: From U.K. Reliance Inds. Ltd., 3,200 Mts. Rs. 2,35,25,072.

TERTIARY BUTANOL From FRG: Glindia Ltd., 3,100 kgs., Rs. 71,988.

TETRAHYDROFURAN: From FRG: Cipla Ltd., 6,916 kgs., Rs. 2,42,480. From FRG: Searle (India) Ltd., 5,096 kgs., Rs. 1,65,-406.

TETRAHYDROFURAN: From RG: Wyeth Laboratories Ltd., ,092 kgs., Rs. 48,937.

TITANIUM DIOXIDE RUTILE: rom Australia: Goodlass Nerolac Paints Ltd., 20,000 kgs., Rs. 5,25,821. From Japan: Garware aints Ltd., 17,500 kgs., Rs. 4,-5,774. From U.K. Chemicals e Universe P. Ltd., 40 Mts. Rs 0,93,190.

TOLUENE DI ISOCYANATE: rom FRG: Industrial Products Mfg. Co. 2000 kgs., Rs. 55,828.

TRIACETIN: From U.K. Hitkari Multifilters Pvt. Ltd., 960 kgs. Rs. 24,117.

3,4,5, TRIMETHOXY BENZALDEHYDE: From France: Burroughs Wellcome (I) Ltd., 9,300 kgs., Rs. 28,55,600. From France: Keprim Laboratories: 1,000 kgs., Rs. 2,96,392. From France: Suchem Laboratories, 2,000 kgs., Rs. 5,97,230. From Netherlands: Le Roi Drugs & Chemicals Pvt. Ltd., 1,505 kgs Rs. 4,-27,922.

M-XYLIDINE: From Switzerland: The Atul Products Ltd., 1,400 kgs., Rs. 97,227.

Plastic Materials Imported

BOMBAY
(From 1-2-88 to 2-2-88)

EMULSIFIABLE POLYETHYLENE WAX: From Japan: Didesu Chemicals P. Ltd., 2 5 Mts., Rs. 50,310; Sumeta Resins & Chemicals, 5,000 kgs., Rs. 1,00,-620; Yuman Chemicals, 1,000 kgs., Rs. 20,124.

HDPE: From Canada: Bharat Vijay Mills Ltd., 148.5 Mts., Rs. 17,79,556; From Japan: Ecoplast Pvt. Ltd., 15.180 Mts., Rs. 1,93,-985; From Saudi Arabia: Bitto Plastic Products, 17,150 kgs., Rs. 2,14,870; Grover Overseas P. Ltd., 2,05,800 kgs., Rs. 25,78,428; From Yugoslavia: Vikram Plastics, 30 Mts., Rs. 3,62,462.

HDPE MOULDING POWDER: From Japan: Diamond Polyplast P. Ltd., 32 Mts., 4,68,454: Kejriwal Plastic Ind., 16 Mts., Rs., 1,97,542; National Plastic Enterprises, 16 Mts., Rs. 2,11,270.

LDPE: From FRG: The Paper Products Ltd., 49.5 Mts., Rs. 8,10,537; From Singapore: Essge Plastics (P) Ltd., 16.5 Mts., Rs. 2,18,508: From Qatar: Bajaj Plastics Ltd., 33 Mts., Rs. 4,71,292: From Yugoslavia: Amikoop World Enterprises, 60 Mts., Rs. 7,44,447; Vikram International, 100 Mts., Rs. 12,40,579.

LLDPE: From Canada: Kailash Structurals P. Ltd., 16,000 kgs., Rs. 2,18,118.

MODIFIED POLYETHYLENE WAX: From Japan: L.N. Chemicals Inds., 200 kgs., Rs. 64,152.

PLASTICIZER: From U.S.A.: Royal Cushion Vinyl Products P. Ltd., 14,206 kgs., Rs. 2,02,941; 31,752 Mts., Rs. 4,17,602; The National Leather Cloth Mfg., 31,-752 kgs., Rs. 4,17,604; 31,752 kgs., Rs. 4,05,236.

POLYPROPYLENE: From U.S.A.: Caprihans India Ltd., 31.125 Mts. Rs. 5,37,458.

POLYSTYRENE: From Korea: A 1 Arts Gambhir Indl. Estate, 17 Mts., Rs. 3,24,451; Tata Exports Ltd., 10 Mts., Rs. 1,80,991, From Mexico: Concord International, 75 Mts., Rs. 10.77,543; Standard Plastic Inds., 50 Mts., Rs. 7,18,362; From Saudi Arabia: Janta Plastic Corpn., 100 Mts., Rs. 18,91,610.

POLYSTYRENE RESIN: From Korea: Ampabak Prop Devidayal Plastic, 10 Mts., Rs. 1,78,837. Asha Plastics, 10 Mts., Rs. 1,78,387; Consolidated Plastics, 10 Mts., Rs. 1,78,387; Kuppi Udpadan, 20 Mts., Rs. 3,56,774; National Inds., 10 Mts., Rs. 1,78,-387; Plastica, 10 Mts., Rs. 1,78,-387; Prakash Plastic Inds., 34,-000 kgs., Rs. 6,22,418; Sanjay Plastic Inds., 17,000 kgs., Rs. 3,24,451; Sarvoday Bangle Works, 10 Mts., Rs. 1,78,387; Standard Plastic Inds., 34 Mts., Rs. 6,22,416; Tata Exports Ltd., 170 Mts., Rs. 30,76,847; The Supreme Inds. Ltd., 12.5 Mts., Rs. 9,31,134; White Feather Pen Co., 10 Mts., Rs. 1,78,387, From Saudi Arabia: Tata Exports Ltd., 20 Mts., Rs. 3,61,982.

POLYURETHANE RESIN DESMODUR: From FRG: Ishwar Arts, 18 Mts., Rs. 4,55,712.

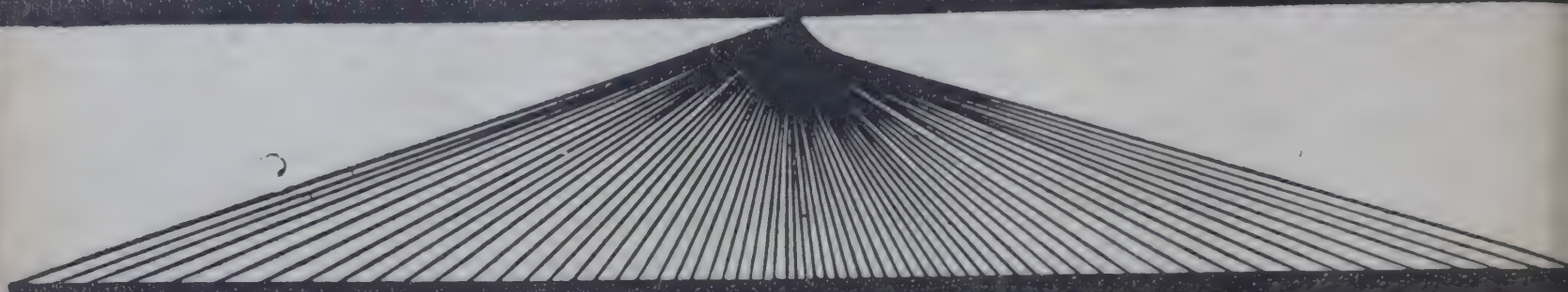
POLYVINYL CHLORIDE: From Saudi Arabia: The Supreme Inds. Ltd., 144.375 Mts., Rs. 16,68,-266.

PVC RESIN From Korea: Sanghvi Leathers P. Ltd., 50 Mts., Rs. 7,58,279; Uniplas India Ltd., 400 Mts., Rs. 54,85,372; 3,009 kgs., Rs. 39,18,119; From Mexico: Prakash Pipes & Inds. Ltd., 300 Mts., Rs. 34,58,548; From Yugoslavia: The Standard Batteries Ltd., 25.2 Mts., Rs. 3,19,-583.

PVC RESIN PASTE GRADE: From Korea: The Bhor Inds. Ltd., 30 Mts., Rs 4,51 817.

PVC RESIN SUSPENSION GRADE: From Korea: Anukampa, 50 Mts., Rs. 7,02,418; Bharat Plastics, 50 Mts., Rs. 6,54,443; Kundalia Inds., 250 Mts., Rs. 32,57,015; The Bhor Inds. Ltd., 200 Mts., Rs. 28,04,382; The Supreme Inds. Ltd., 400 Mts., Rs. 52,09,136; 150 Mts., Rs. 20,13,-105; From Yugoslavia: Selfshine Inds., 100 Mts., Rs. 11,11,896.

CAXTON



- Mono-Ammonium Phosphate
- Di-Ammonium Phosphate
- Mono-Sodium Phosphate - Crystals
- Mono-Sodium Phosphate - Anhydrous
- Sodium Acid Pyro Phosphate
- Di-Sodium Phosphate - Crystals
- Di-Sodium Phosphate - Anhydrous
- Tetra Sodium Pyro Phosphate
- Tri Sodium Phosphate - Anhydrous
- Mono Calcium Phosphate
- Di-Calcium Phosphate - $2H_2O$/Anhydrous
- Tri-Calcium Phosphate
- Mono Potassium Phosphate
- Di-Potassium Phosphate
- Tetra Potassium Pyro - Phosphate
- Sodium Acetate - Crystals
- Sodium Acetate - Anhydrous
- Tri Magnesium Phosphate
- Zinc Phosphate
- Aluminium Phosphate

Available in All Grades
TECH - C.P. - Pharma grade - A.R./L.R.

Manufacturers

CAXTON CHEMICAL INDUSTRIES

Regd & Reply Office
CORNELIAN 104, AUGUST KRANTI MARG
5TH FLOOR, FLAT NO. 3, BOMBAY-400 036
PHONE: 38 05 43

Admn. Office
70, MASJID BUNDER ROAD, HANSRAJ KARAMSHI
BLDG, ROOM NO. 32, 3RD FLOOR, BOMBAY-400 003
PHONES: 855 05 25, 855 34 91, 855 26 72
GRAM: CAXCHEMIND, BOMBAY-400 036

FACTORY-
Village-Waliv VASAI (EAST)
Dist: Thane (MAHARASHTRA) Phone: 26

CAXTON CHEMICAL INDUSTRIES
25
SILVER JUBILEE
1962-1987

FOR YOUR REGULAR REQUIREMENTS OF :

BUTYL ACETATE
OCTYL ACETATE
DI OCTYL MALEATE

Please Contact Manufacturers :

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